Railway Maintenance Engineer

Volume 14 November, 1918 Number 11

(With which is incorporated the Engineering and Maintenance of Way Edition of the *Railway Age Gazette* and *Railway Engineering and Maintenance of Way.*)

Published on the last Thursday preceding the date of issue by the
SIMMONS-BOARDMAN PUBLISHING CO.,
TRANSPORTATION BUILDING, CHICAGO, ILL.

NEW YORK: WOOLWORTH BLDG. CLEVELAND: CITIZENS' BLDG.
WASHINGTON: HOME LIFE BUILDING.
LONDON: QUEEN ANNE'S CHAMBERS, WESTMINSTER.

EDWARD A. SIMMONS, *President.* LUCIUS B. SHERMAN, *Vice-President*
HENRY LEE, *Vice-President and Treas.* M. H. WIUM, *Secretary*
H. H. SIMMONS, *Business Manager.*

ELMER T. HOWSON, *Editor.*
WALTER S. LACHER, *Managing Editor.* JOHN G. LITTLE, *Associate Editor.*

Entered at the Post Office at Chicago, Ill., as mail matter of the second class.
Subscription price, $1.00; foreign countries, $2.00.

WE GUARANTEE, that of this issue 7,650 copies were printed; that of these 7,650 copies, 7,305 were mailed to regular paid subscribers, 54 were mailed to advertisers, 77 were mailed to exchanges and correspondents, and 214 were provided for new subscriptions, samples, copies lost in the mail and office use; that the total copies printed this year to date were 87,700, an average of 7,972 copies a month.

The *Railway Maintenance Engineer* is a member of the Associated Business Papers (A. B. P.) and of the Audit Bureau of Circulations (A. B. C.).

CONTENTS

EDITORIAL 363
LETTERS TO THE EDITOR 365
RAILS OR SHELLS 366
CHICAGO, MILWAUKEE & ST. PAUL PLANT 366
NORFOLK & WESTERN RECLAMATION PRACTICE 369
CHICAGO, BURLINGTON & QUINCY PLANT 370
THE RESAWING OF RAILS ON THE SANTA FE 371
MAINTENANCE OF WAY IN WINTER 372
A CONVENIENT TRUCK DERRICK 372
ACTIVITIES OF THE RAILROAD ADMINISTRATION 373
A HEAVY SWITCH PLATE CONSTRUCTION 375
GOVERNMENT CONTROLS TIMBER TREATING INDUSTRY 376
PHYSICAL CONDITION OF MASSACHUSETTS RAILROADS 377
COLLEGE BOYS AS TRACK LABORERS 377
LETTERS FROM OVERSEAS 378
BRIDGE AND BUILDING MEN MEET IN CHICAGO 379
REPORT ON REPAIRING AND STRENGTHENING OLD MASONRY 379
ESSENTIAL WORK; C. A. MORSE 381
THE MATERIAL SITUATION 383
REPORT ON SOURCES OF RAILWAY WATER SUPPLY 384
INVESTIGATING OLD BRIDGES FOR HEAVIER LOADING; C. F. LOWETH 386
REPORT ON SHIPPING COMPANY MATERIAL ECONOMICALLY. 387
GENERAL NEWS 392

Volume Index Furnished on Request

It has been customary in the past to include the index of articles published in the *Railway Maintenance Engineer* during the year in the closing or December issue of the volume and to mail it to all subscribers regardless of whether they had use for it or not. In conformity with the instructions of the War Industries Board to conserve paper the index for this year will be mailed only to those subscribers who have need for it and who express a desire for it. The 1918 index will be prepared and ready for distribution immediately following the appearance of the December number. A request by post card or otherwise addressed to the *Railway Maintenance Engineer*, 750 Transportation building, Chicago, will bring a copy of this index without charge. It will assist us in determining the number of copies to print if those desiring it will advise us at once.

A Win the War Issue

In common with all interests in this country, the *Railway Maintenance Engineer* is now concerned primarily in the winning of the war. For this reason a special effort is being made to present that information which will be of the most assistance to those engaged in maintaining the tracks and structures of our military lines of communication at the present time. No problem is of greater importance to our military success now than the conservation of steel for war uses. For this reason special attention is directed to the article entitled "Rails or Shells?" in this issue, emphasizing ways in which several railroads are increasing the service secured from rails and thereby reducing their requirements for new steel. Another article entitled "Government Controls Timber Treating Industry" describes the measures which the Forest Products Section of the United States Railroad Administration is taking to conserve the preservatives and treating plant capacity for those railway and military uses most essential at the present time. The report of the convention or war council of the American Railway Bridge and Building Assotiation also contains information of special value under present conditions. In this period of shortages of both labor and materials a paper on "Essential Work," which was presented at this meeting by C. A. Morse, assistant director of operation of the United States Railroad Administration, which is abstracted in the report of this convention, is particularly timely.

Do the Essential Work First

Our country is now engaged in a war which requires its maximum effort if it is to be successful. It is, therefore, necessary to separate the essential from the non-essential in railway work as well as all other work in order to conserve labor and materials. This makes it necessary for maintenance of way men to concentrate their efforts this year on the upkeep of the track and structures to the neglect if necessary of less essential work, such as the trimming of a ballast line, which, while desirable, is not essential to the safe operation of trains. It is the patriotic duty of every man in the maintenance of way department responsible for the handling of men and materials in whatever rank he may be, to distribute the forces under his charge in such a way as to insure the performance of all essential work in order that safety of operation may be assured and the road be at all times in condition to handle the traffic of the country.

EDUCATE THE MEN IN THE RANKS

THIS IS A DAY of propaganda and educational methods. The Food Administration has been enabled to secure the voluntary co-operation of the people in putting into effect its drastic regulations after informing them of the necessity for such measures. Other organizations are adopting similar methods. A branch of the Fuel Administration is now working in co-operation with the Railroad Administration in demonstrating the necessity for the conservation of coal on locomotives and at power stations to the employees who use it.

There is an opportunity for the extension of such methods into other branches of railway service. We refer at length elsewhere in this issue to the necessity for the curtailment of the demands for steel for maintenance of way uses. In spite of the economies which are now practiced, an investigation on the average division will uncover large quantities of supplies which could either be used in their present condition or released as scrap. This material is not being held out because of a reluctance to co-operate with the railway management or with the Government, but through failure to appreciate the necessity for this material. Railway officers are responsible for their men understanding the importance of these matters. The success of any measure depends ultimately upon the man on the ground rather than upon the general officer at his desk. Human nature is much the same the world over. Men will respond more willingly to appeals for co-operation when they understand the purpose of those appeals. We need more educational work among the employees in the maintenance of way department.

WHEN THE STORMS COME

THE SIGNS OF approaching cold weather will call to the minds of most railway men visions of the strenuous days spent last winter in fighting some of the worst storms in history. Extreme seasons, as a rule, do not follow in close succession, although there is no law of nature to prevent an immediate repetition, but whether we have another hard winter or not, heavy falls of snow and sleet are bound to occur in some parts of the country. Be that as it may, every man who went through last year's troubles does not relish a repetition of them and will exert every effort to be ready for whatever comes, so that he may fulfill his responsibility with the least mental anguish for all concerned.

Preparation for winter in a large sense implies a perfection of line, surface and drainage that will insure good riding track after the ballast freezes and is really a measure of the extent to which the season's program has been completed. Preparation for storms is another matter; it implies essentially the perfection of the organization and equipment for fighting them. This means that there must be an adequate supply and proper condition of everything used during the storms from brooms to rotary snow plows, and where an adequate reserve supply cannot be had, mental note must be taken of possible supplies to be obtained on short notice when needed. Under organization must be considered the determination of the system under which the work may be done, the selection of the men to handle the various details, possible emergency sources of labor and facility for housing and feeding men on short notice. Such items as these are merely suggestive; it is impossible to outline to each man exactly what he ought to do or what is the best plan. He must review his past experience, analyze the causes of his principal troubles and devise means or methods that will enable him to meet the situation better and with fewer sleepless nights than heretofore.

WAGE INCREASE AND ITS RESPONSIBILITIES

THE WAGE INCREASES granted to maintenance of way employees by Supplement 8 to General Order 27 are liberal and are bringing relief to the man power situation of this department. With the increased rates authorized, maintenance of way officers should now be in a position to fill up the gangs which have been short-handed for a long period, and, further, they should be able to exercise some selection in recruiting their forces, which was impossible with the old rates of pay. However, if the most is to be made of the new conditions the officers of this department will do well to study the effects of wage increases on the employees of industrial concerns in their vicinities. Too often it has been the experience that wage increases have been accompanied with a loss of efficiency.

Without discussing the reasons of this reaction on the part of the men, the fact remains that, with winter almost upon us, this is no time to countenance a decrease in output per man or to ignore the experience of others who have relied on wage increases to cure their labor difficulties, with disappointing results. In the end it is output that is essential rather than full gangs, however desirable a full labor quota may be. Output per man is directly effected by the completeness with which his work is planned and laid out for him. It seems, therefore, that the extent to which the wage increase may result in benefits to the department rests not alone in the number of men, but also in improved supervision.

ONE WAY TO HELP WIN THE WAR

WE ARE NOW confronted with the fact that the steel producing capacity of this country is not sufficient to meet the combined requirements of our military forces and our essential industries. As indicated in the article, "Rails or Shells?" on page 366 of this issue, the present monthly production of steel is from one-half to three-quarters of a million tons less than the estimated requirements of the War Industries Board. This deficit exists after the supply for non-essential industries has been cut off and the needs of the essential industries curtailed to their minimum necessities. It is evident that further curtailment is necessary in the essential industries if our forces overseas are not to be denied the supplies which they need and no one will consider this possibility for an instant.

Our most important business now is to win the war. Everything else must be secondary to this one object. An adequate supply of steel for military purposes is one of the most important conditions to the successful conclusion of the conflict. The only way the present deficit can be eliminated is by the turning in of more scrap metal and by decreasing the demand for new steel by making that now in use render more service, since the output of new steel is now at its maximum.

As employees of an essential industry using a large tonnage of steel, even in these years of inadequate maintenance, railway men have a particular responsibility in this matter. This is especially true of those in the maintenance of way department, where several million tons is used each year in the form of rails, track fastenings, bridge spans, etc.

The prompt collection of scrap material is economical at any time. It is a military necessity now. This does not refer solely to the large accumulations at the central points of collection. It applies equally to the small piles of bolts or spikes at the outlying section houses or to the materials lying in the weeds along the right of way. If every foreman could be made to realize that each bolt

turned in means a bullet there would be a great increase in the amount of steel made available.

Of even greater importance than the collection of scrap is the securing of the full life from all steel in service. On another page we describe the practices followed on several roads to reclaim rails for further use. The deterioration of rails under traffic is common on all roads, but the methods of overcoming this deterioration vary widely. Some of the practices described in the article referred to have been followed on those roads for many years, while on other lines rails in no worse condition have been scrapped. Tracks must be maintained and rail which is badly battered or otherwise defective must come out. It cannot, however, be scrapped now when this means drawing on the already inadequate supply of new steel for rails to replace it. The remedy is to reclaim it so that it may be returned to use and made to render more service. While this is necessary now as an emergency measure it has a further advantage that it will be found to yield economies sufficiently important to justify its continuance after the present crisis has passed. In some instances this will mean the installation of new equipment, in others it will mean the greater utilization of existing equipment, for with unified operation of the railways there should be no reason why a road without reclamation equipment cannot divert its rails to a plant on another road which has surplus capacity. It has been said that food will win the war. It may be said with equal force that steel will win the war. Railway men can help provide this steel by reducing their requirements to the minimum consistent with the maintenance of our transportation facilities through the maximum use of present supplies.

STILL MORE STRENUOUS

IN A REPORT submitted to the Director General by the regional director of the Central Western region a few days ago, the statement was made that the federal managers as a whole report their tracks and properties in as good condition as last year. The report then proceeds with the apparently contradictory statement that the lines in that area are short approximately 230,000 tons of rail, with only 3,500 tons per week in immediate prospect, while the tie situation is also reported as unsatisfactory, the shortage on September 1 being estimated at approximately 6,200,000 ties, or an average of 125 ties per mile of line in that area.

In a general way this report is typical of conditions over the country as the season of active maintenance of way work draws to a close. The past year has been one of unprecedented problems in all industries and these problems have increased in severity as the months passed. Fortunately for the roads, this year has witnessed few floods and weather conditions have been generally favorable. Also by concentrating efforts on the maintenance of the tracks and the structures carrying the traffic it has been possible to make a comment as favorable as that in the opening sentence in spite of the shortages of material. However, such conditions can only be continued for a limited period of time. Tracks cannot long be maintained without rails or ties. There is no question but that they are going into the winter in worse condition than a year ago and that they will require more careful supervision as a result. The responsibilities of the maintenance of way department are increasing as this condition becomes more acute from month to month. The coming winter will call for the best in every man in this branch of the service in order that no possible interruption in traffic may be brought about.

LETTERS TO THE EDITOR

RENEWING HOOPS ON TANKS

Carbondale, Ill.

TO THE EDITOR:

Owing to the fact that it is now almost impossible to get wrought iron hoops, making it necessary to equip tanks with steel hoops, which are much less resistant to corrosion, more attention should be paid to their maintenance. The life of the hoops depends upon the location of the tank and the care taken of them. On water tanks located near cinder pits where locomotive gases are in the air, on tanks that frequently run over and on tanks that are seldom painted, the life of the hoops is rarely more than five or six years. On the other hand, with favorable conditions, the same hoops may last 15 to 20 years.

In replacing hoops it is a common practice to change the bottom hoop first and replace the remaining hoops in turn, progressing toward the top. There is a serious objection to this practice, particularly in the case of a tapered tub, for every time that a hoop is taken off a shower of rust, dust and cinders which was concealed behind the old hoops falls down over the hoops below.

In a tapered tub, with the bottom larger than the top, there is a small crack behind the top edge of each hoop, so when a hoop above is taken off the rust and dirt fall down behind the one below it, starting new rust almost before the crew is off the job. By starting to replace the hoops at the top of the tank, all the dirt and rust are brought down as the work progresses and each hoop is clean, ready to tighten.

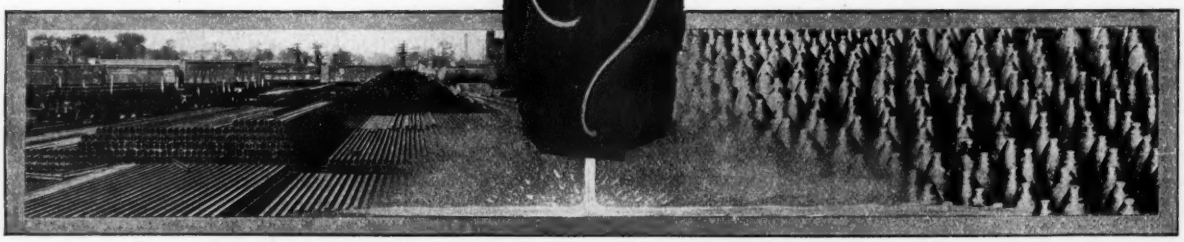
H. J. BARKLEY,
Master Painter, Illinois Central.

NEW BOOKS

Proceedings of the American Railway Engineering Association. 1569 pages, 6 in. by 9 in. Bound in half Morocco, cloth or paper. Published by the American Railway Engineering Association, Karpen Bldg., Chicago. Price, half Morocco $7, cloth $6.50 and paper $6.

This volume contains the complete report of the convention of the American Railway Engineering Association, held in Chicago in March, 1918, in addition to monographs published in bulletins of the association during the year. The convention report covers 1,268 pages, of which 1,074 are devoted to the reports of committees and 194 pages to the discussions of these reports at the convention. The monographs occupy 301 pages in addition to a large number of diagrams and drawings bound in the back of the book. The matter of the greatest interest to maintenance of way men in this volume is the report of the committee on the Economics of Railway Labor, which, including the discussion, covered 118 pages. Among the various matters covered in this report may be mentioned an extensive bibliography and a discussion of the feeding and housing laborers, concerning which data was obtained from most of the railroads in the country by means of a questionnaire. Another specially valuable report is that on Stresses in Track, in which the results of the work of this important study are given out for the first time. One of the special papers in the back of the volume is an exhaustive report made by a special committee of officers of the Pennsylvania Railroad and the Pennsylvania Lines on the subject of screw spikes and tie plates covering 276 pages and a large number of tables and diagrams.

RAILS OR SHELLS?



RAILS OR SHELLS? This is the question which every railway man answers consciously or unconsciously every time he makes or approves a requisition for any supplies requiring steel to-day. It is absolutely essential to the success of our military operations overseas that our railways—our lines of communication in this country—be maintained in condition to enable the supplies to flow uninterruptedly to the seaboard and on to our forces and those of our allies in France. It is also equally essential that they have the munitions and other materials which they need there.

The output of finished steel in this country has been increased greatly during the last four years. That for September established a record. On the assumption that this rate will be continued, it is estimated that the half year's production will be 20,000,000 tons. In this same half year the War Industries Board estimates the requirements at not less than 23,000,000 tons, and they may reach 25,000,000 tons. With the greatly enlarged program of the War Department it is to be expected that these demands will increase rather than diminish, but even on the basis of the figures given above there is an evident annual shortage of from 6,000,000 to 10,000,000 tons of steel. The War Industries Board is endeavoring to meet this by scaling down the requirements of the essential, but non-war, industries, which include the railways.

The roads of this country are among the largest industrial users of steel. Their normal requirements for rails alone exceed 3,000,000 tons per year. Even this should now be increased largely because of the fact that the roads have been inadequately maintained for several years, one authority estimating that the rail renewal program of the roads is now over 10,000,000 tons in arrears. It is evident that this deferred maintenance must be made good, but as pressing as the demands now are, they must not be allowed to detract from the available steel output more than absolutely necessary to maintain traffic. The War Industries Board has stated that "the last quarter hour will win the war and in that quarter hour the last shell will be fired." That shell may be made of steel that has been saved by cutting down the requirements for rails or track fastenings.

It is the duty of the employees of the maintenance of way department to help provide steel for this last shell. This can best be done by securing a little longer life from the materials now in service. This at once brings up the question of the reclamation of materials such as rails, which in themselves constitute the largest single drain on steel production by the railways. The transfer of usable rails released from main lines for reuse in less important lines or sidetracks is a practice so common as to require no explanation. However, this will not solve the problem of supplying rails for the more important main lines from which the rails are being released because of battered ends or other defects. Some roads have given a great deal of attention to the sawing of such rails to remove battered ends and have effected large economies, while others have given this subject almost no consideration. A few roads have even sawed out defective parts from rails which have failed in service and have returned the remainder to use.

These and similar expedients promise material relief for the present shortage of rails and may be made to reduce the demands upon the steel production. Because of this fact, we present on the following pages descriptions of the practices which a number of roads have developed for the reclamation of rails. These will be followed in later issues with similar articles describing the reclamation of other track materials. These articles are presented at this time not only because they point out ways by which large economies can be effected, but primarily because they will assist in making available the steel which our men overseas will use in the last shell that will win the war.

The Chicago, Milwaukee & St. Paul Plant

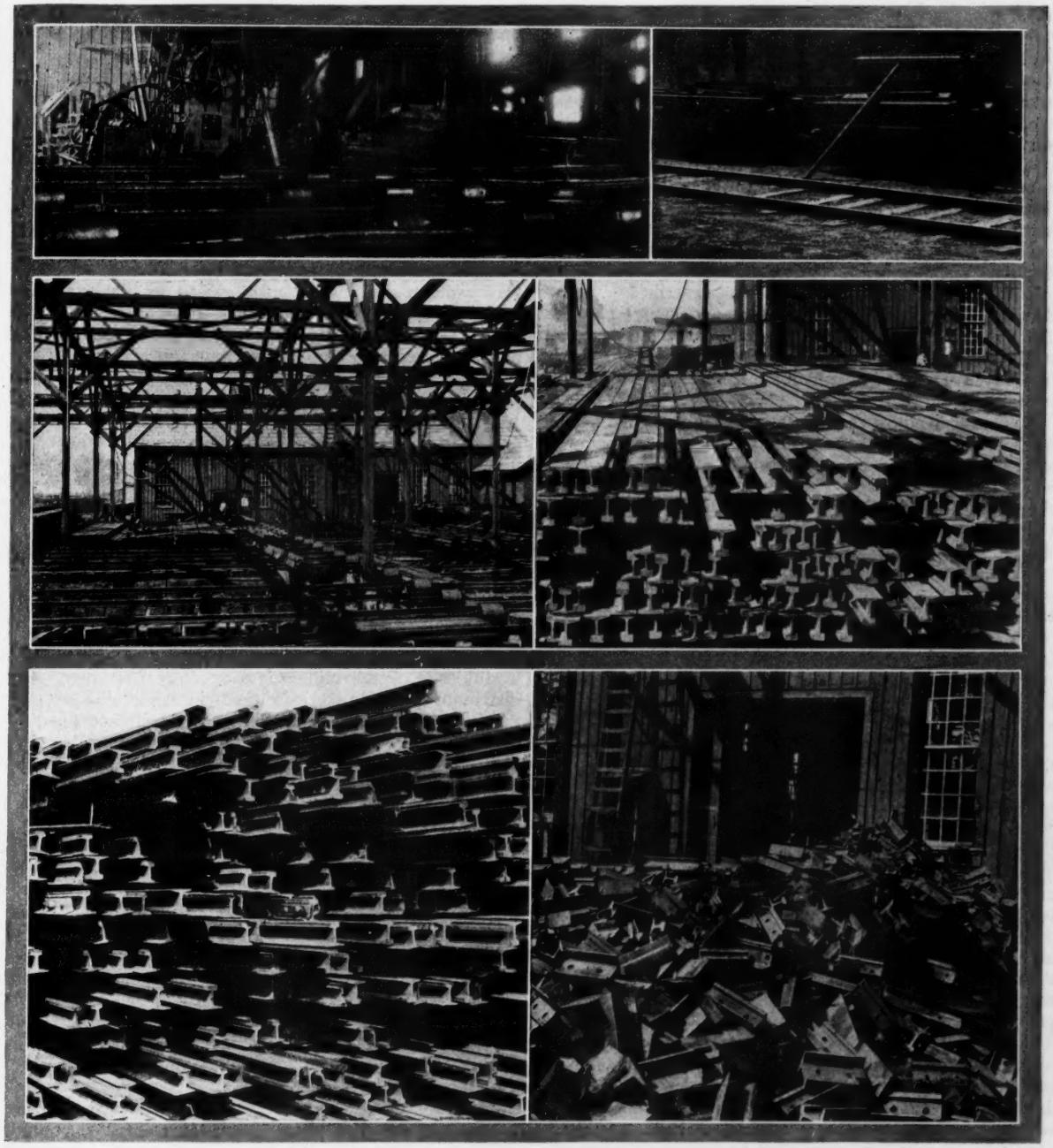
IT is doubtful if any railway in this country has in effect a more complete system for the reclamation of rails than the Chicago, Milwaukee & St. Paul. For many years it has operated a reclamation plant at Savanna, Ill., to which are shipped all rails and track fastening from the entire system. This plant is devoted entirely to the handling of rails, tie plates, joints and anti-creepers, no bolts or spikes being received there. Its methods for the reclamation of rail are so complete that no piece weighing 60 lb. or over per yard or more than four feet long and not otherwise defective goes into the scrap.

This plant was located at Savanna when the lines did not extend west of the Missouri river and it was then relatively central. Since that time the Pacific Coast extension has been built and other lines added in the northwest. As all rails and fastenings from the entire system of over 10,200 miles are sent to this one point, it results in a considerable haul in some instances. To avoid this tentative plans have been made for a second plant to be located at Mobridge, S. D., but it has not yet been built and all work of this character is still concentrated at Savanna. In the description which follows, reference will be made only to the reclamation of rails, the handling of fastenings being reserved for a later issue.

This plant was built originally to enable the serviceable life of rails to be increased and economies effected.

These results are secured by (1) resawing and straightening battered and surface bent rails and thereby improving their riding qualities so that they can be returned to high speed lines, and (2) by reclaiming the usable portions of rails which have broken or have failed otherwise and returning them to service. As it has developed and as experience has been gained with the use of reclaimed rail, the operations at this point have been expanded until practically no rail now goes into the scrap pile which there is any possibility of using in any manner on the railroad.

As stated above, all rail released from relaying or other operations is sent direct to Savanna by the division forces. Even though classified as scrap by the men releasing it on the line it is sent to the reclamation plant, where it is sorted and any material which can be made serviceable is held out, while that suitable only for scrap is placed on the scrap dock or transferred into other cars



Views at the Savanna Rail Mill

Interior of the Mill (Showing Skidways in Foreground and One of the Drills at Left).
View of the Rail Storage Yard
Rail as Received from the Line, Showing Broken and Battered Ends
Sections Sawed from Short Lengths for Shipment to Frog Shops.
Rails Sawed, Awaiting Shipment.
A Pile of Ends Sawed from Rails Awaiting Sale as Scrap

for shipment to some place of disposal as the purchasing agent directs.

Rail weighing under 60 lb. per yard and fit for further service is held for use in minor branch lines, logging roads or temporary tracks, while that with broken ends or otherwise defective is sold as scrap. All rail weighing from 60 lb. to 100 lb., inclusive, is sawed when its condition warrants its return to main tracks, but no rail is sawed for sidetrack use unless the ends are badly battered or split. Any rail which is not curve worn over ¼ in. at the gage line is classed as curve worn main line rail and is returned to use on the low side of a curve. Rail which is curve worn too badly for use is converted into guard rails, while that with half-moon breaks in the base is laid in sidetracks without sawing unless the breaks are close enough to the end to enable them to be sawed out and leave 24 ft. or more of rail fit for main line use.

The minimum length of rail which is reclaimed for use in main tracks is 24 ft. and for yard tracks 18 ft. Lengths shorter than 18 ft. and over 4 ft. are used in the manufacture of frogs and switches, being cut to exact length and shipped to the company frog and switch shop at Tomah, Wis.

The operation of the rail mill was described by John Reinehr, superintendent of the frog and switch shop at Tomah, Wis., and formerly foreman of the rail saw mill at Savanna, Ill., in the *Railway Maintenance Engineer* for May, 1917. The details of the operation of this plant are taken from that article.

When received off the line the rails are weighed on the track scales and, as a rule, are sorted in a preliminary way when unloaded for section and condition, using air hoists for this purpose. They are sorted to the following classification: (1) Rails fit for relaying without sawing, (2) rails to be sawed, (3) scrap rails. Rails which show no appreciable wear, or rails too much worn to be used for any but sidetrack purposes, and which may have good ends and need no sawing for the use intended, are piled in a class by themselves. The rails fit for main track service are placed in one separate pile, and those fit only for sidetrack service in another. All rails not enumerated above, if fit for any service after being straightened and sawed, are either unloaded directly onto a skidway leading into the reclaiming plant or on adjacent skidways from which they can be moved readily into the plant. The last classification describes all rails not fit for any service. They are piled subject to sale by the purchasing department.

RECLAIMING OPERATIONS

Rails passing through the reclaiming plant for resawing are pulled broadside up to the straightening machine (a home-made hydraulic press) by a rope and a belt-drive drum handling from 8 to 20 rails at one time. Two men are assigned to this machine, their duties being to keep the rails close to the straightening machine, and to remove the sawed crop ends from the building by means of a push car running on a track leading from the building. The rails then pass through the straightening machine under the hydraulic ram, and are straightened while supported on two bolsters spaced five feet apart. Either line or surface bends can be straightened. This machine is manned by a straightener and two helpers. After straightening, the rails are pulled broadside onto the saw table or carriage by means of a horizontal air hoist manipulated by the straightener.

Arriving at the saw table, the rail is inspected by two of the three sawyers, who classify it into one of the following grades: Rails of 85-lb. section or heavier are divided into (1) main track rails, (2) No. 1 second quality, (3) second quality, (4) No. 1 side track, (5) side track and (6) curve-worn main track. Rails of less than 85-lb. section are classified between (1) main track, (2) second quality, and (3) side track. They indicate on the base of the rail by a suitable chalk mark whatever grade the rail will qualify for. They also determine where the rail should be sawed for a good end. They then drop the rail broadside on to the saw table on its side with the head toward the saws and spot it endwise to suit the defective ends. The chief sawyer then clamps the rail to the table with a pneumatic clamp and feeds the table to the saws with a pneumatic feed, cutting through the rail in from 12 to 20 sec., depending on the section. The saws are spaced 31 ft. apart to cut one foot from each end of a 33-ft. rail simultaneously. For shorter rails, each end must be sawed separately. All rails are sawed to lengths of even feet. After the rail is sawed the table is returned to the original position, the clamp raised and the rail run endwise by means of belt-driven live rollers on the saw table, manipulated by the third or chief sawyer, until it clears the saws. It is then pulled off the saw table broadside by the two chippers (one at each end of the rail).

After removing the rail from the saw table, the chippers remove the fins or burrs raised by the saws and pass it broadside on to the drills, four of which are in service (two at each end) manned by four men and placed in a staggered position, so that four rail ends are drilled at one time, each man and each machine drilling each alternate end.

The men thus far enumerated handle their own rails to and from the machines, helping one another when sawing rails up to 90-lb. section. When sawing heavier rails it has been found expedient to give the two chippers one helper and the four drillers three helpers, thus adding four men to the crew.

Before the rails pass out of the mill to the sawed stock piles a man applies a template to the head of each rail marked by the sawyers as a main track or second quality rail to classify it according to depth or thickness in variations of 1/32 in. each, marking the base of the rail No. 1, 2, 3, or 4, as the template may indicate. The rollers leading out of the mill are manned by four men, who distribute the rails and pile them in stock piles or load them on cars direct as desired. The rails are piled or loaded with air hoists mounted on overhead rails spanning the centers of and running the full length of the skidways.

Sorting the rails for condition and uniform thickness of head is of much value in obtaining good track results and economy in maintenance cost. The rails classed as sawed main track rails are calipered for thickness of head and make as good track joints as new rails if new or unworn joint fastenings are applied. The rails classed as second quality rails are as safe as main track rails. They are more or less worn, but will give good service in branch line main tracks. The ends will match up to an even surface, as the heads are calipered the same as the heads of the main track rails. In order that the track men may know the kind of rails sent them, the gage classification or number is indicated on the shipping bill. Only one class of rail is loaded on a car.

The rails classed as main track, curve-worn rails are outside curve rails, with the head worn not to exceed 7/16 in. at the top of the rail. The ends are sawed and the heads calipered the same as the other main track rails. They make good track joints and give satisfactory service in branch line main tracks. Side track rails are for side track purposes only. Rails for switch and frog purposes are cut from pieces too short for other track service, but otherwise in good condition. They are sawed to length for this purpose and shipped to the frog shop.

This plant will saw from 400 to 450 rails of 85-lb. section or heavier per day. Eighteen men are employed in the mill, while 5 men are required to bring the rail from the stock piles to the saw and 4 to return it into stock. All rail in the receiving yard is handled by locomotive cranes, while that in the storage yards is moved by air hoists supported by overhead runways, as shown in one photo.

As an indication of the work done and the results accomplished at the plant, the following figures for the calendar year 1917 are of interest:

SALVAGE FROM OPERATION

Tons Realized from Rails Sawed

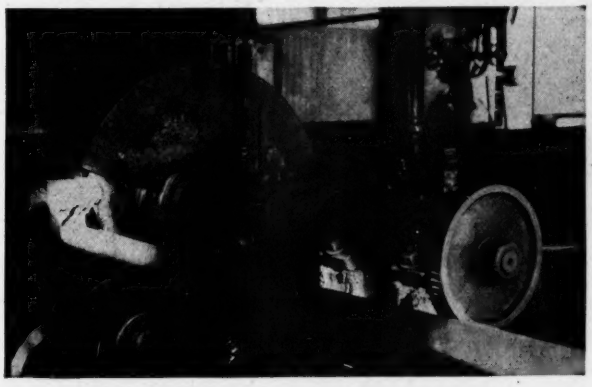
No. of Tons Sawed	M. T. Rails	2nd Quality Rails	S. T. Rails	Rails for Frogs	Scrap Rails
9751	3397	2292	2841	363	353

Kind and Class of Material	Tons Received	Tons Shipped
Sawable and Usable Steel Rails	15,006	17,602
New Steel Rails	1,820	2,993
Scrap Steel Rails	15,139	14,658
Scrap Iron Rails	807	1,192

It is estimated from close observation that two-fifths of the 2,841 tons of side track rails were recovered by straightening and sawing from rails which would otherwise have been sold as scrap. With an average price of scrap steel rails during the year $38.43 and of relaying rails of $55 per ton, a difference of $16.57, the salvage between the usable and scrap value of this 1,136 tons of rail amounted to $18,824. It is also estimated that 10 per cent of the 5,689 tons of main track and second quality rails were recovered from scrap condition by straightening and sawing, creating an additional credit by salvage of $9,428.33. Also 368 tons of steel rails were recovered from scrap condition for frogs, saving $6,098. Including track fastenings reclaimed, there was a demonstrable salvage from operation last year of $38,903, while the total cost of operation and maintenance was $29,323, leaving a net profit of $9,580. This salvage recovered from approximately 6 per cent of the total tonnage handled has covered the entire operating expenses and shown a profit of $9,580 in spite of the fact that the cost of operation has risen greatly because of increased rates for labor, etc. It takes no account of the improvement in the condition of the 9,751 tons of rails sawed. The cost per ton for sawing rails last year, including all operations from the taking of the rails from stock piles or cars, into the mill, straightening, sawing, chipping and returning them into stock piles ready for shipment was 82.7 cents per ton.

The Norfolk & Western Reclamation Practice

ANOTHER road which has given careful consideration to the problem of securing the full life from rails is the Norfolk & Western. On this line particular attention is given to the determination of the time when they should come out of the track in order to prevent their premature removal. To this end definite limits of allowable flange and tread wear have been fixed and gages have been designed to enable one to ascertain the wear on any rail readily. Before any stretch of rail is renewed it is examined on the ground personally by the assistant general manager and the principal assistant engineer. Specifications for relayer rails for various uses have also been prepared which limit the amount of wear and other defects

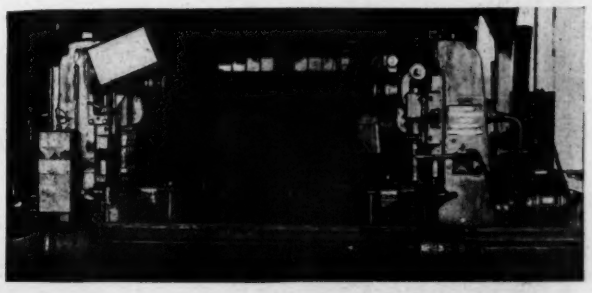


THE RAIL SAW IN THE ROANOKE SHOP

which are permissible for rails for different classifications and uses. These limits of wear, specifications and methods of determining them were described by W. P. Wiltsee, principal assistant engineer of the Norfolk & Western, in an article published in the *Railway Maintenance Engineer* for April, 1918, page 143.

Class two relayer rail is that which has battered or otherwise defective ends, which, if resawed, would meet Class one requirements for use in main or branch lines. This rail must be not less than 30 ft. long after being sawed, although 10 per cent short lengths varying by 1 ft. with a minimum length of 25 ft. will be accepted. The top wear must not exceed ⅛ in. or the side wear ¼ in., while it must be in good condition in all other respects and with a smooth riding surface.

Rail of this character is sent to the central system reclamation plant at Roanoke, where it is unloaded onto



THE THREE-SPINDLE DRILL PRESS

storage piles with a magnet. It is taken from the skids in the receiving yard to the rail saw as opportunity offers. After the forward end is sawed, the rail passes by the saw and the rear end is cut off. It is then moved across the skids to the drill presses, where one end is drilled at a time. At the same time it is gaged and further classified according to the eight classifications of the specifications for relayer rail. The rail is then moved down the yard and either piled on the skids or loaded in cars on a depressed track. This sawing gives a rail that is fit for first-class track, although it has been the practice to relay these sawed rails in branch line tracks with a heavy but not fast movement.

The rail-sawing plant consists of one 42-in. rail saw blade, driven by an 80 hp. motor at a speed of 2,700 r. p. m., with a capacity for sawing one cut of 85-lb. rail in

12 sec.; two 3-spindle drill presses with a capacity of 350 holes in 8 hours, and rail classification and storage skids. This plant, at the time of construction, cost about $20,000. The average daily output in 8 hours is 450 rails sawed at both ends. A rail saw is good for sawing 35,000 rails. The labor cost is 10 cents per rail for handling it from the pile in the yards, sawing, redrilling, classifying and either loading it on a car again or piling on the receiving yard. The maintenance is very small; including interest and depreciation on the plant, these rails can be resawed for about 20 cents per rail, or 40 cents per ton.

It is found that the removal of 10 in. will cover practically all the battered ends, less than 1 per cent of the rail sent in requiring more cut off the end than this. Therefore, it is the practice to cut 10½ in. off the end of the rail, which, according to the standard drilling, makes the third hole in the original length the first one on the resawed rail. Both ends of the rail are sawed, as they are both damaged, although the receiving rail on double track always shows the most wear.

The Chicago, Burlington & Quincy Plant

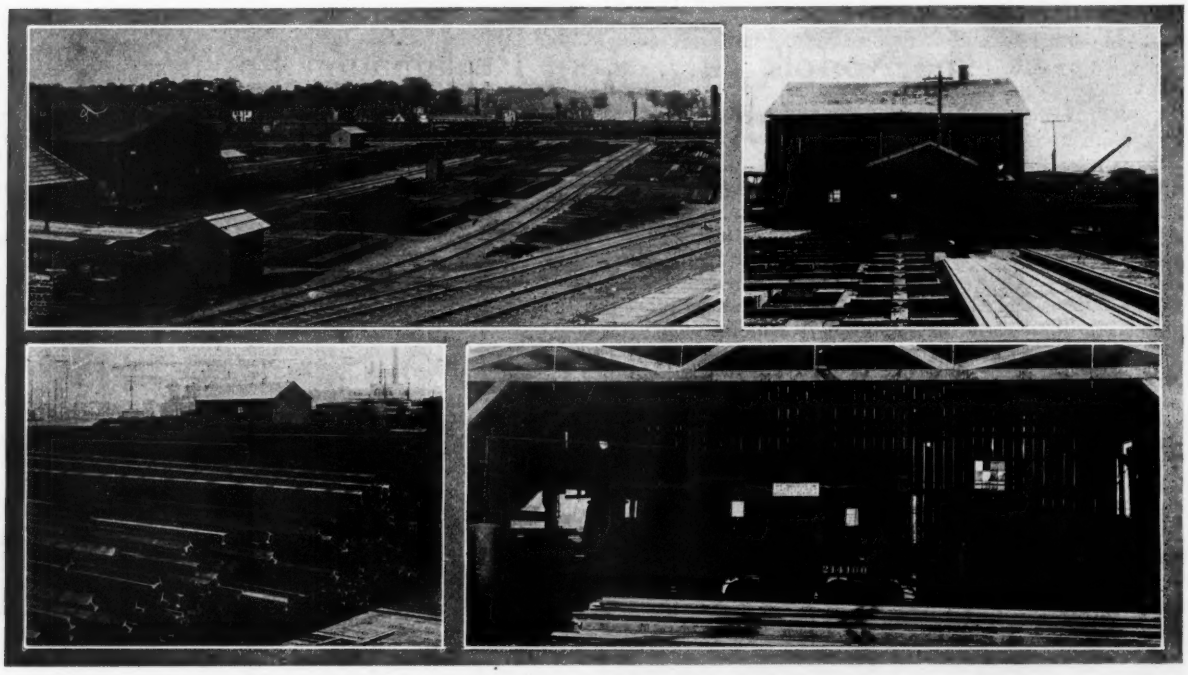
THE Chicago, Burlington & Quincy has also been a pioneer in the reclamation of rails, having operated a rail sawing plant at Galesburg, Ill., since 1888. The plant now in operation at that point is a portable one, mounted on cars, although it has not been moved for several years and is now partially housed in a temporary frame structure. It is operated on one shift for about five months each year.

All rail released in relaying operations is inspected and classified by one of three system inspectors prior to its removal from track if possible or as it lays on the shoulder if he is unable to get there before. These inspectors work out of the rail reclamation office at Galesburg and are employed to insure uniformity of classification between different division. Each rail is gaged as to height and classified as to condition between (1) rail to be sawed; (2) rail suitable for relaying in main passenger lines without sawing; (3) that fit for branch lines unsawed; (4) that suitable for yard track unsawed, and (5) scrap, and the classification is indicated by white paint marks on each rail. Only 85, 90 and 100-lb. sections are reclaimed by sawing.

All rail is sent to Galesburg except where considerable quantities are classified out of face as scrap when it may be loaded direct for sale. Even where rail is to be sent to another line for relaying without sawing it is shipped to Galesburg for classification, as it has been found that this can be done more economically there than on the line with the delays from traffic. As a result over 85 per cent of all rail released from track comes to this point.

As the rail is received at Galesburg it is unloaded with locomotive cranes, and sorted into two classes for sawing, three unsawed and scrap. Rail sent in as scrap is sorted in unloading and any considered usable after reclamation is sorted out and held until slack time during the winter, when it is worked over. As much as 3,000 to 4,000 tons of rail is accumulated frequently in this manner, and in numerous instances as much as 10 per cent of a shipment classified as scrap is reclaimed in this way.

No inspection as to necessity for straightening is made on the line, this being done as the rails are transferred on the runways leading to the saw. As shown in one of the photographs two sets of rolls lead to the saw, one of which passes under a hydraulic straightener. Rails re-



GENERAL VIEW OF THE GALESBURG RAIL YARD

GENERAL VIEW OF THE MILL AND YARD
RAILS TAKEN FROM SCRAP PILES AWAITING RECLAMATION

RUNWAYS LEADING TO THE SAW (ONE AT RIGHT PASSING UNDER STRAIGHTENER)
THE SAWING OUTFIT MOUNTED ON A CAR

quiring straightening are placed on the set of rolls at the right, while others go direct to the saw on the rolls to the left. At times as many as 50 per cent of the rails required straightening.

From the straightener the rails move to skidways in front of the saw, which, with two drills and a steam power plant, are mounted on a 74-ft. car. The rails are raised by an air hoist onto the saw table, one at a time. A rail is then clamped into position, one end sawed off by a 42-in. circular saw, the rail moved along and the process repeated at the other end. The rail is then run under a drill at one end, and then at the other. Two double three-spindle drills are provided, one side of each drill only being used and the other provided for emergency. As the rail leaves the drills the burrs are chipped off by hand by the men feeding the drills. It is then loaded directly on cars for shipment to the point of relaying. Particular attention is paid to the prompt return of rail released from one track to service in another, the mill operations being timed in close harmony with the field operations. It is aimed to turn rail over twice each season and frequently it is turned three times in a single year.

It is the standard practice to saw 15 in. off the end of each rail, leaving a 30-ft. 6-in. rail from a standard 33-ft. rail. Rails too short to yield this length are cut to 27 ft. 6 in. or to 27 ft. or even feet below this, with a minimum length of 21 ft. for important main lines, of 18 ft. for branch lines, and of 14 ft. for yard tracks. As short lengths are sawed they are held at one side of the mill and matched up in pairs of even length. They are then loaded in pairs in order to maintain the stagger of the joints in track.

As the rail is loaded it is classified into first grade No. 1 (with less than 1/32-in. surface wear on the head); second grade, No. 1 (1/32 in. to 1/16 in. wear); first grade No. 2 (1/16 in. to 3/32 in. low, and second grade No. 2 (3/32 in. to ⅛ in. low). All rails with over ¼ in. side wear on the head are further classified as No. 3 suitable for yard tracks and occasionally for branch line main tracks. The rails are assembled separately by grades as they are loaded on cars at the mill, so that one grade is laid continuously in the track.

Scrap rails are utilized in the making of guard rails, the entire requirements of the system being supplied in this way. Approximately 2,500 guard rails were turned out in 1917.

All work incident to the operation of the rail reclamation plant is done on a piece work basis. This includes the loading and unloading of rails by locomotive cranes, sawing and all other operations. Twenty men, including the foreman, are employed at the mill proper. While these rates change from time to time, this gang was recently paid the following rates per 100 rails sawed:

75-lb. rail,	$16.07
85-lb. rail,	17.55
90-lb. rail,	18.18
100-lb. rail,	19.47

These prices include the taking of the rails from the skids in front of the saw through all operations to and including their loading on cars on leaving the plant. This rate is divided among the men on a fixed ratio, which includes the foreman, engineer and fireman.

The operation of this plant and all handling and inspection of the rail at Galesburg and in field is under the supervision of the general storekeeper.

The Re-sawing of Rails on the Santa Fe

THE Atchison, Topeka & Santa Fe has been resawing rail for a number of years at its rail mill at Newton, Kan., where a large part of the rail released from track which is suitable for reuse in main tracks is received for inspection, straightening and sawing. Rails to be used in passing tracks, yards, etc., are not resawed unless they contain defects or breaks which can readily be removed by sawing off a portion of the length. The determination as to what rail is to be resawed originates with the system rail inspector in the chief engineer's office, who makes an independent examination of the rail recommended for renewal by the roadmasters and superintendents. His report not only contains his opinion as to the necessity for this renewal, but in cases where he favors this action his recommendation may be appended with a statement such as the following:

"The rail on tangent in the westbound track will make good heavy relayer rail after having about 6 in. cut from the leaving end and 18 in. from the receiving end. After cutting, this rail should be supplied with new joints. The curve-worn rail should be used for side tracks without cutting and with the best of the old joints."

The final conclusion as to the rail program appears on the assignment-of-rail charts, which not only show the disposition of the new rail, but also indicate where the first relayers and second relayers are to be used. With this information at hand, the superintendent of the rail mill is readily kept advised of the disposition of all rail he received for resawing.

When rail to be resawed is released from track it is loaded on cars and sent to the rail mill at Newton, Kan. Roadmasters are required to load the rail so that all that which had laid in continuous stretches in track is kept together, while curve-worn rail is kept separate from that in tangent. This reduces to a minimum the amount of reclassifying to be done at the mill, although the rails are carefully reinspected there to eliminate any which had been improperly included in a given lot.

The rail mill equipment includes an hydraulic straightener or gag press, a friction saw and drills. Built at the time when 30-ft. rails were standard, two saws were placed in fixed positions with the saw blades 28 ft. apart, it being the idea to cut one foot off each end of each rail. As soon as the 33-ft. rails began to come into the mill it was necessary to abandon the use of one of the saws and at the present time all rails are given successive cuts by a single saw. A plan is now being considered for restoring the second saw to use by placing it on a movable base, so that two cuts may be made simultaneously at any desired distance apart. Drill presses are provided for drilling new holes in each end of the rail, these presses being so placed that they operate simultaneously on opposite ends of independent rails.

At the mill all rails to be resawed are unloaded on skids at one side of the plant and are drawn in by power-operated cables onto rollers on which each rail is run through the straightening press. Here all surface kinks and bends of any kind are removed, the bending process also serving as a test for crystallization. If no indication of this is developed the rail is passed over another set of skids to the rail saw, where it is classified as relayer, side track back track, bridge guard rail or scrap, the first only being sawed unless there are defects which may be removed from the others by sawing. The usual cut from the rails is 9 in. at each end, but a departure from this standard is made in the case of rails released from double track

lines as indicated in the quotation given above. No attempt is made to saw the rails so as to utilize one of the old bolt holes since this involves a greater accuracy of sawing than is considered advisable in view of the tendency of the saw to burr after a few hours' run and thus cut the rail somewhat shorter. Furthermore, this would involve sawing off a smaller portion of the end than is considered necessary to remove all the effect of the batter. With the plant operating with one saw as at present, an average of one rail is handled through the plant each minute at a cost of about $1 per ton at the present wages, including all expenses from unloading to loading. After passing through the plant the rail is carried out on rollers to a yard, where it is piled by section and grade.

Excellent results have been obtained with the use of the resawed rail in branch main lines, where it is found to have good riding qualities, while the maintenance cost of track laid with resawed relayers is noticeably less than with that which has not been sawed. However, one of the greatest savings is in the use of short pieces cut from rails with defects or which have been bent in wrecks, etc. Most of this rail is used in frogs and switches and that somewhat curve or tread worn is used for frog guard rails. Short pieces are used for fillers in frogs and even a certain amount of rail classified as scrap is passed through the saw mill to cut it to suitable lengths for service as property markers.

(Descriptions of the practices followed in the reclamation of rails on several other roads will appear in the December issue. With these articles there will also appear a description of the process of rerolling rails which has been adopted quite extensively on a number of other roads in recent years as a means of increasing the service secured from them.—Editor.)

MAINTENANCE OF WAY IN WINTER

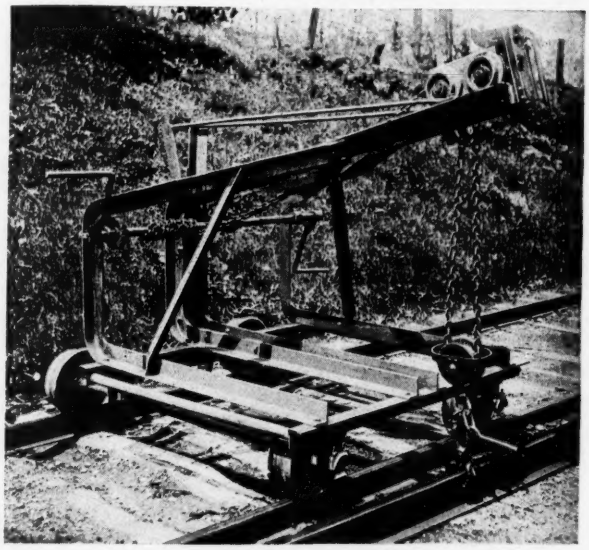
IN VIEW OF THE approach of winter, with all that it means to the maintenance of way men whose duty it is to keep the roads passable for the essential war traffic, a list of references to articles on winter work on railroads, prepared by the librarian of the Bureau of Railway Economics, Washington, D. C., is of special value to those who have access to current periodical files. This list covers 53 mimeographed pages and refers to text books and articles on the subject of winter on railroads dating as far back as 1871. The list is classified by subjects under two principal heads, "Maintenance of Way" and "Operation of Railroads," the classification under the first head being listed below:

Maintenance of way in winter:
- General discussion of problems and methods.
- Track protection methods in detail.
- Snow fences.
- Snow hedges.
- Snow sheds.
- Miscellaneous methods.
- Care of water stations.
- Switches.
- Yards, terminals, etc.

Each reference gives not only the name and date of the article, the author and publication, but also a brief synopsis of the information contained, and in many cases this is sufficiently complete to give one the desired information without reference to the article itself. For instance, several references to articles on the protection of switches and interlocking or on snow handling in yards, etc., cover fully a half a page each. The same is true of references to snow sheds, and as the treatment is chronological it gives the reader an opportunity to trace the history of the development of these structures up to the present date. The list includes such articles as "A Comparison of Two Forms of Snow Shed Construction," in the *Railway Maintenance Engineer* of January, 1918.

A CONVENIENT DERRICK TRUCK

WHILE EFFORTS to save common or semi-skilled labor have been directed largely to the elimination of manual lifting and pulling, in the case of track work this has been done for the most part only through the use of locomotive cranes, rail layers, etc., in cases where continuous operations are being conducted which involve repeated lifting. Little or no provision has been made for the heavy lifting operations that occur occasionally in the work of an ordinary section or yard gang, and as a result of the growing shortage of labor and the gradual but steady reduction in the size of gangs, there has grown to be a definite need for lifting devices of this character, not only to permit of economy in the use of labor, but to make it possible to do the work at all. As it is now, the renewal of a rail or a frog frequently involves the combining of two or more gangs in order to obtain a sufficient force to do the necessary lifting.



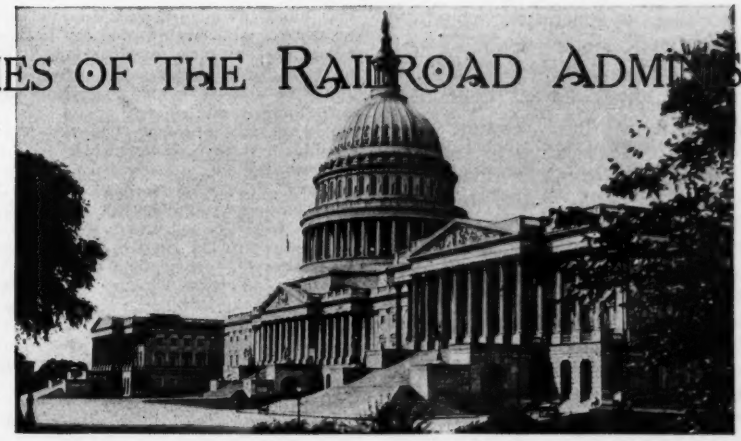
READY TO LIFT A RAIL

To obviate this difficulty, a device has been developed and placed on the market recently by the Madden Company, Chicago, under the name of the Derrick Truck Car. This car is designed to enable two men to lift weights up to one ton, while at the same time affording a means for rolling or trucking a considerably larger load along the track. Six 33-ft. rails can be carried readily on it. As seen in the photograph, it consists of a structural steel frame mounted on 14-in. flanged wheels. The platform of the car affords convenient carrying space for rails, frogs or other material that it is desired to handle, while an overhanging boom equipped with a chain-operated trolley or carrier serves as a hoist. This boom has sufficient overhang to raise or lower a rail in line with the ends of the ties, while the rolling trolley affords a means for shifting the load and setting it down at any point on the platform. The weight of the car is 850 lb., but it is so balanced that two men can readily remove it from the track.

Aside from the use of this device on track work for which it was especially designed, considerable interest has been taken in its applicability to storehouse use.

ACTIVITIES OF THE RAILROAD ADMINISTRATION

Limited Progress Being Made on Additions and Betterments



New Instructions Regarding Preparation of the Budget for 1919 Work

CONSTRUCTION and improvement work continues to drag and only limited progress is being made in the rebuilding and enlargement of the facilities which were so badly congested last winter and which will probably be even more congested within a few months. A total of $575,859,590 has been specifically authorized by the Division of Capital Expenditures of the Railroad Administration for additions and betterments work other than equipment on the roads under government control up to October 10, of which $113,347,989 is chargeable to operating expenses and $462,511,601 to capital account. Of these amounts a total of $173,441,682 was expended to August 31, of which $25,792,546 was charged to operating expenses and $147,649,136 to capital account. Thus only 30 per cent of the amounts authorized have been expended previous to September 1, leaving $402,417,908 authorized and unexpended. During the month ending with October 10, approximately $30,000,000 of additions and betterments work was authorized, while during the month of August approximately $25,000,000 or 4.4 per cent of the amount authorized was expended.

The employment of women in track work, numerous instances of which have received notice from time to time, has been brought to a definite conclusion in the eastern and the central western regions, through orders issued by the regional directors, definitely prohibiting the employment of women as section laborers or as truckers in freight depots and warehouses, the reason assigned being that this is not considered suitable work for women.

The operation of the supplemental wage advances made by the Railroad Administration have brought to light various inconsistencies and irregularities, but perhaps not more than would be expected with any blanket order covering such a diversification of employments. A number of instances have been discovered where men working as helpers have been given full mechanic's rates and were paid back time on the higher basis. Order No. 9 to Circular No. 2 issued by the Director of the Northwestern region calls attention to the fact that there is no authority for such action and requires that investigations of such cases be made.

In last month's issue there were published complete instructions issued by the regional directors relative to filing of claims for deferred classification of railroad employees. Supplement No. 6 to Circular No. 30 issued by the Director of the Northwestern region provides that when a man who has received deferred classification on account of his employment leaves the service his local draft board shall be notified immediately.

A plan was also on foot to arrange for furloughs of skilled railway men who had been inducted into the army and whose services were especially necessary on the railroads, and an announcement of such an arrangement with the Adjutant General's office of the War Department was given out by the director of the Northwestern region, but in Supplement No. 7 to Circular No. 30, dated October 11, and Supplement No. 9 to Circular No. 112, dated October 10, the Northwestern and Central Western regional directors, respectively, announce that the War Department has ruled that no furloughs for railroad work will be granted to men in military service.

The loss of live stock killed by trains, according to a circular issued by Director General McAdoo, has been greatly reduced during the past year in the Southern and Southwestern states through the special efforts to secure the co-operation of owners of stock in keeping it off the right-of-way and to secure a better enforcement of stock laws.

The regional purchasing committees are sending out Form P. C. 4, requisitions for cross ties, to be used for all orders placed for cross ties to come from other roads or other regions. A Form P. C. 5 has also been issued entitled "Cross Tie Situation," which is to be sent out in duplicate monthly commencing October 1 and showing the number of ties required during the year, requirements already provided, the source of supply during the balance of the year, ties purchased along the right-of-way during the month, ties received or in transit from other railroads during the past month, ties due from other railroads and the estimated number of ties available for shipment to other lines during the next 30 days.

The Forest Products Section of the Central Advisory Purchasing Committee has issued instructions through the regional purchasing committees for the roads to furnish statements of lumber on hand. Forms issued for this purpose cover statements of the percentage of lumber requirements for 1918 and 1919 on hand and the percentage of estimated requirements under order.

Assignment of Ballast Cars

A regional order has been issued calling attention to the fact that the close of the active construction season will make available for other uses the large number of cars which have been in ballast service. These should be released from maintenance or construction work and assigned to other service, such as the handling of cinders, stone, gravel, sand, etc., both company and commercial. In order that the roads may retain control of these cars so that they will be available for use next spring, it is not

considered proper to place them in general service where they will become badly scattered.

INDUSTRY TRACKS

The director of the Southwestern region has issued Circular No. 102 in regard to the interpretation to be placed on General Order No. 15 relative to industry tracks and cancelling his circular No. 41 relative to the same. This provides that where a division of the maintenance expenses of the side tracks as between the railroad and the industry will operate to produce substantially the expense apportionment specified, such a percentage division may be adopted by agreement, providing that this may be subject to modifications from time to time when it appears that the conditions have changed. Provision must be also made for a periodic checking of the accuracy of agreed percentages.

The question has been raised as to whether, in cases where the traffic involved does not justify an expenditure on the part of the railroad for the track construction up the clearance point, the track may not be put in at the sole expense of the industry. The answer given to this is that in such cases the track should not be built at all.

PUBLIC IMPROVEMENTS

The director of the Northwestern region has issued Circular No. 41 covering the manner in which projects for street or road construction or other public improvements contemplated by the authorities of any state, county, district or municipality shall be handled:

1. The public authorities are requested to take up propositions for public improvements direct with the Federal management of the railroad interested, where the cost chargeable to the railroad is in excess of $500.
2. Where the cost is less than $5,000, the federal manager should submit a report to me with his recommendations, for my approval, before agreeing to the improvement.
3. Where the cost is $5,000 or more, the federal manager should submit a report to me, with his recommendations, and, when approved by me, will be forwarded to the director, division of capital expenditures, with suitable recommendations, for final approval, before agreeing to the improvement.
4. After having obtained advice that the proposition is approved, the requisite D. C. E. Form should be submitted.
5. A copy of the federal manager's recommendation should be sent to the district director, where the work comes within the jurisdiction of a district director, in order that he may supplement the report if he finds it necessary, with further information, together with his recommendations.

PREPARATION OF BUDGETS FOR 1919

The director of the Southwestern region has issued instructions for the preparation of the budgets for 1919, which are to be submitted to him not later than December 1, in order that he may become sufficiently conversant with them to forward them to the Division of Capital Expenditure at Washington not later than December 31. These notices were issued with detailed instructions as to the form on which the budgets are to be submitted and these are published below in so far as they concern items having to do with roadway and structures.

WIDENING CUTS AND FILLS, FILLING TRESTLES, ETC.: Where there is a definite program for a general improvement of a certain district, this should be indicated on a map or chart. Where it is miscellaneous work more in the nature of ordinary maintenance, no illustrative data is required, other than a description, and location of work so that it can be readily identified on a map.

BALLASTING: Information should be submitted showing the character and quantity of ballast, as well as the location, and it should be specifically stated whether the improvement is a general one or whether it is patch work. A map or chart should be used to indicate the location, upon which should likewise be indicated the source of supply.

RAIL AND OTHER TRACK MATERIAL: Maps or charts should be submitted showing the location of any extensive main track renewals upon which should appear sufficient data to clearly indicate the location, age and section of the rail to be removed. This chart, as a rule, should show the entire rail situation on the district which is affected by the budget recommendations.

BRIDGES, TRESTLES AND CULVERTS: Where there is a definite program for increasing the carrying capacity of a line there should be a chart or map indicating this district and its relation to the main traffic routes.

TUNNEL AND SUBWAY IMPROVEMENTS: Sufficient data should be submitted to indicate clearly the location and character of the improvement.

TRACK ELEVATION OR DEPRESSION: Full information should be given indicating whether or not the work is done in compliance with an ordinance, legislative authority or agreement, or whether for the purpose of improving operating conditions.

ELIMINATION OF GRADE CROSSINGS: Full information should be given indicating whether or not the work is done in compliance with an ordinance, legislative authority or agreement, or whether for the purpose of improving operating conditions.

GRADE CROSSINGS AND CROSSING PROTECTION SIGNALS: Information should be furnished giving location and description of the proposed work.

ADDITIONAL MAIN TRACKS: A map or chart should be submitted showing the location of the additional main track and its relation to the operating divisions or routes of which it forms a part, in order that the apparent reasons for the improvements will be shown. A traffic density chart should be made indicating the number, classified as between passenger and freight trains now being handled on the division upon which the improvement is to be made.

ADDITIONAL YARD TRACKS, SIDINGS AND INDUSTRY TRACKS: In the case of passing tracks, a map or chart should be submitted showing the location of existing passing tracks and their car capacity, and the new tracks and the chart should likewise show the distance between existing passing tracks on the operating district or subdivision. In the case of additional yard tracks, maps or charts should be submitted clearly indicating the general scheme of development and a relationship established between the capacity of the yard and business now handled and the ratio which will exist after the work contemplated is completed.

CHANGES OF GRADE OR ALINEMENT: Maps or charts should be submitted showing the location of the work in question and the reason for it, giving very fully the economic analysis and estimated results. A condensed profile is preferred if available.

SIGNALS AND INTERLOCKING PLANTS: In case of automatic block signals, chart should be submitted showing location of these signals, together with traffic density chart showing existing traffic, together with such other data as will clearly set forth the reasons for the work. In the case of interlocking plants, information should be supplied indicating location and necessity.

TELEGRAPH AND TELEPHONE LINES: Chart should be submitted indicating the location of the work, as well as complete information, as to the purpose.

ROADWAY MACHINERY AND TOOLS: Information should be supplied showing the purpose, as well as the economic result, from the expenditure.

SECTION HOUSES AND OTHER ROADWAY BUILDINGS: A statement should be made indicating the location and necessity for the structure.

FENCES AND SNOWSHEDS: A statement should be made indicating the location and necessity of the house or structure.

FREIGHT AND PASSENGER STATIONS, OFFICE BUILDINGS AND OTHER STATION FACILITIES: A statement should be made indicating the location and necessity of the buildings.

WATER STATION AND APPURTENANCES: Complete information should be supplied showing the character of and necessity for the work proposed.

SHOP BUILDINGS, ENGINE HOUSES AND APPURTENANCES: A map should be submitted showing the location of the work in question, together with full descriptive information as to the necessity for and the character of the improvement.

WHARVES AND DOCKS: The major improvements of this character should be indicated on a general map.

COAL AND ORE WHARVES: The major improvements of this character should be indicated on a general map.

GRAIN ELEVATORS AND STORAGE WAREHOUSES: The major improvements of this character should be indicated on a general map.

REAL ESTATE: The major improvements of this character should be indicated on a general map.

The regional directors of the Southern and Southwestern regions have also issued instructions outlining the policy to be followed in determining what renewals shall be made in bridge work and track work. These are given in detail below:

1. BRIDGE WORK—PILE OR TRESTLE BRIDGE REPAIRS.—In making out the program for bridge work for 1919, the following rule

should be observed: Whenever a pile or trestle bridge can be repaired so as to make it safe for one additional year at cost of not over 7 per cent of the estimated cost of renewal, it should be arranged to make the repairs, using untreated material for the repairs. If repairs can be made that will extend it's life for two years for 8 per cent per year on the cost of renewal, three years for 9 per cent, or four years for 10 per cent per year, repairs should be made rather than renew the structure. This is in order to conserve labor and material.

2. TRACK TIE RENEWALS—INSPECTION BEFORE RENEWAL.—The railroads of the country are facing a serious shortage in track ties for 1919 use. Instructions should be issued that estimates for track ties for 1919 be made only from personal inspection of the supervisor of all of his track; and no ties should be replaced that can be carried over one year and have the track in safe condition. Tie requirements may be reduced 10 per cent if this is done conscientiously by all supervisors.

3. SWITCH TIE RENEWALS—RENEWING IN SETS.—In making out the program for switch tie renewals for 1919, the following rule should be observed. Where 50 per cent or more of the individual ties in a switch require renewal, a full set of new ties should be ordered and inserted, and the ties that are recovered from sets renewed in full that have one or more years' service in them should be used for repairing sets where less than 50 per cent require renewal. Renewing individual ties in switches with new ties should be done only in emergency cases.

4. NEW JOINTS—APPLYING TO GET FURTHER LIFE OUT OF RAIL.—There is a serious shortage of steel, and it will be impossible to secure the steel rail that the railroads need for 1919 delivery. In many cases, rail that would ordinarily be renewed can be kept in the track two or four years longer if new joints are applied, replacing the badly worn joints now in the track. New joints should be ordered for such rail as this, instead of the new rail, and they should be put in "to a face," taking out all old joints between limits of territory for which they are ordered; new bolts should be used with the new joints.

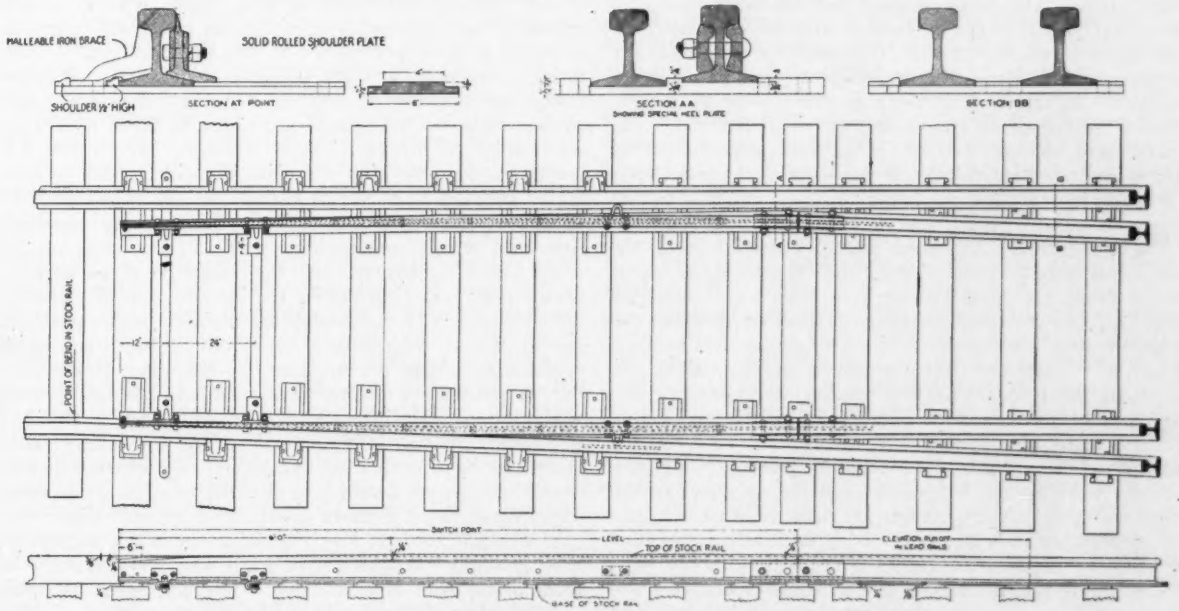
HEAVY SWITCH PLATE CONSTRUCTION

THE TREND of modern track practice in providing construction of increased strength for the heavy traffic requirements of the present day is well illustrated by recent developments in track specialities. Among these attention is directed to late designs of solid bottom switch riser plates and switch heel plates, which have proved of considerable economy in maintenance and have recently been adopted by several of the eastern trunk lines. The illustrations show shoulder heel plates designed to provide adequate bearing for both the stock rail and the lead rail, where there is not sufficient clearance to permit the use of standard shoulder tie plates. A shoulder tie plate has been considered a necessity to meet heavy traffic conditions, and it is nowhere more essential than at the heel of a switch.

The heel plates illustrated provide a run-off for the two inside rails from the elevation of the switch rails, as obtained by the risers on the switch plates, and provide shoulders to hold both rails in position. A sufficient number of heel plates must be provided to carry the rails from the heel of the switch to the point where the spread is sufficient to allow standard shoulder tie plates to be installed.

The relative elevations of the inside and the outside rails, as well as their correct positions in the curve of the switch lead, are obtained by machining seats in the plates which fix the position and elevation of both rails. The tie spacing at the heel of the switch is varied slightly for different angle turnouts, so that heel plates for any switch length may be furnished to the same detail for use with any frog number, which should be used with the given length of switch.

Switch riser plates also are machined with a seat for the base of the rail and for the rail brace as illustrated, which insures accuracy of position and elevation with positive shoulders for holding the rail. These plates are formed entirely by rolling without any subsequent forging. There is no hollow on the under side, thereby affording the full area of the plate for a bearing on the tie. The illustrations show the plate for an 80-lb. rail having a minimum thickness of ½ in. under the stock rail, a 6-in. bearing width on the tie and a riser 4 in. wide under the switch rail. These plates are also furnished for heavier traffic conditions and for heavier rail, having a minimum thickness of ¾ in. under the rail and affording a 7-in. bearing width on the tie.



LAYOUT OF A SWITCH EQUIPPED WITH SOLID BOTTOM PLATES

These plates are obtainable from several switch and frog manufacturers, including the Ramapo Iron Works of Hillburn, N. Y., to whom we are indebted for the above information. Representatives of this concern who have shown these plates in detail at recent exhibits have

found that a majority of the railroads insist on solid bottom switch riser plates, to insure a full bearing on the tie and that plates made similar to the above illustrations have given most satisfactory results in severe service.

Government Controls Timber Treating Industry

THE EFFECT OF THE WAR on the timber-treating industry and on the supply of treated timber available for the railroads was the topic presented for consideration at a conference of members of the American Wood Preservers' Association, the committee on Wood Preservation of the American Railway Engineering Association and representatives of commercial treating plants and of manufacturers of preservative materials, which was held at Madison, Wis., on October 10. At this meeting John Foley, associate manager of the Forest Products section of the United States Railroad Administration, took the opportunity to inform the industry regarding the plans of the Government.

The Railroad Administration is fully committed to timber preservation and to the treatment of all forest products for which plant capacity and preservatives are available. With the centralization of tie purchases in the hands of the Railroad Administration it is necessary for commercial treating plants to change their practices of selling treated ties to that of selling the treatment only.

The questions now confronting the industry are: (1) the extent to which the production of the preservatives now used can be increased; (2) the possibilities of using other preservatives not now commonly employed, and (3) the extent to which it may be advisable to revise present treating practices in order to conserve the supply of preservatives for that work most important.

In discussing the first question representatives of several manufacturers of creosote stated that they saw little hope of increasing the output of that material in the near future. The production of tar has been increased somewhat, but a larger amount is also being burned, so that there is no increase in the quantity available for creosote distillation. Representatives of zinc chloride producers indicated that there is some hope of an increased output of this material, provided sufficient sulphuric acid can be secured. One firm now producing only a limited quantity expects to increase its output considerably by January 1, while another expects to increase its annual production by 1,000 tons next year.

The government has now placed creosote on a so-called clearance list under which the distribution is transferred from the manufacturers to the War Industries Board. The Chemical Section of this board allots the available supply to essential users in proportion to their demands. That for the railroads is distributed to the plants by the Forest Products section, no distinction being made between railroad owned and commercial plants treating railroad materials. Existing contracts for the delivery of oil will not be cancelled or relet, although the oil may be diverted from one plant to another, as the roads using the treated timber are now parts of one unified system, and no shipments of preservatives can now be made by the manufacturers without permits and specific shipping instructions. While all these clearance regulations apply at present only to creosote, they will apply to zinc chloride as soon as it is found that there is any tendency to accumulate larger than the normal supply. The Government does not desire to take over the distribution of zinc chloride so long as the plants can secure it direct, for it does not desire to interfere with the usual procedure of business unless necessary. No steps have been taken to fix prices for preservatives and such action is not contemplated unless it is necessary to control profiteering.

In the investigation of the possibility of developing substitutes for creosote and zinc chloride to increase the total quantity of preservatives suitable for treatment, a representative of one manufacturer stated that his company was prepared to build a large plant for the manufacture of sodium fluoride if it could ascertain that there is a sufficient demand to warrant taking this step. This company now operates a small plant with a capacity of 35 tons per month and is considering the advisability of greatly increasing this output. This material has been used in considerable quantities by the Philadelphia & Reading Coal & Iron Company for the past two years in the treatment of mine props for use in coal mines where it has been found superior to zinc chloride, particularly in the elimination of electrolysis. The serious disadvantage attending the use of this material at present has been the inability to develop a method of control whereby the strength of the solution and the depth of penetration can be determined accurately.

Attention was also called to the possibility of using wood tar as a substitute for the preservatives generally used, and it was stated that from 8,000,000 to 10,000,000 gal. of this material could be produced. While it has certain serious disadvantages its value as a possible substitute was emphasized.

In endeavoring to ascertain the extent to which it may be possible to revise present practices in the treatment of timber to conserve the preservatives for that work which is most important, it was stated that it is the policy of the Railroad Administration in the allotment of creosote to give preference to the preservation of materials involving a high original investment, such as bridge and dock work, and that the treatment of ties and similar materials was made secondary to this. Attention was called to the revision of the specification for the treatment of cross ties with zinc chloride which is now under consideration by the Committee on Wood Preservation of the American Railway Engineering Association, and which contemplates that (1) ties shall be air dried before treatment, (2) they shall be given a short preliminary steaming before the introduction of the zinc chloride and (3) they shall be treated with one-half pound of zinc chloride per cubic foot injected in a weak solution to secure the maximum penetration of the timber. It will also probably be advisable to use ties treated with zinc chloride in parts of the country where this has not been considered economical before and where creosoted ties have been used exclusively, for since it is impossible to secure a sufficient quantity of creosote to treat all of these ties it is more satisfactory to treat them with zinc chloride than to insert them in the track untreated. The question was raised whether it was ever advisable to treat piling with zinc chloride. The consensus of opinion was that piling should not be treated with zinc chloride as long as any creosote was available or was being used for the treatment of ties, but if no creosote could be secured it was better to use zinc chloride than to install the timber in a structure untreated. Several instances were reported where piling treated with zinc chloride has given satisfactory service, particularly in the west.

The conference brought out in an interesting manner the position of the commercial treating plants. There has been much uncertainty regarding the attitude of the government towards this industry, while the difficulty in securing the preservatives has introduced much embarrassment in the negotiations of the companies with their patrons. With the plan outlined there will be no distinction between commercial and railroad owned plants, and each plant is assured of its share of the oil for use on railway work, while the manufacturers are relieved from the difficulty of deciding between patrons in the distribution of their products. As stated above, the quantity of material to be treated will be limited solely by the capacity of the plants and the ability to secure preservatives. The attitude of the commercial plant operators present at the meeting indicated that the plans outlined would be acceptable to the industry and that they would co-operate fully in the necessary measures to maintain the output of treated material at a high point. While it may be necessary to make considerable change in practices and even in plant facilities in some instances to convert them into essential work, this will be done promptly so that the government can secure the output and all plants be kept busy.

PHYSICAL CONDITION OF THE MASSACHUSETTS RAILROADS

THE PUBLIC SERVICE COMMISSION of Massachusetts, in compliance with a recent request, has submitted a report on the condition of the railroads in that state to the Railroad Administration at Washington. The report is based on information secured during the annual inspection of the steam railroads, a practice which was established by the Board of Railroad Commissioners in 1870 and which has been continued up to the present time. The purpose of these inspections is to enable the commission to keep informed as to the conditions of the roads, the manner in which they are operated with respect to the security and accommodation of the public and the compliance of the managements with the laws of the commonwealth.

A portion of the report is devoted to the condition of the roadbed and track of the various roads in the state. The discussion of the labor situation and suggestions for relief are of particular interest to maintenance of way men.

Summarized under the caption: "Had the property been properly maintained for the three years previous to the beginning of Federal control? If not, in what particular has it been allowed to deteriorate?" the report states: "The standard of maintenance on Massachusetts railroads has been somewhat low. By new construction, however, as distinguished from maintenance, considerable has been done during the three years in question, to increase operating efficiency notwithstanding serious financial difficulties."

In discussing the maintenance situation it was brought out that previous to 1916 the Boston & Albany had maintained its roadbed and track satisfactorily. Since that time the former high standards have been rapidly depreciating. There has been delay in trackwork and consequent impairment of surface, alinement, ditching, etc. This is due to a shortage of labor and the inability to pay as high wages as other employers. The conditions on the New Haven have been similar. In 1916 only about 85 per cent of the allotment of men were obtainable for track work. In 1917 the percentage had dropped to 65 and during this year it is still lower. After outlining the present deficiencies in the standards of maintenance and the apparent causes it was suggested "that conditions might be improved by classifying track men as skilled workmen and paying a rate of wages commensurate with their employment." Steps have already been taken to comply with this suggestion and the roads have found it possible, therefore, to enlarge their track forces somewhat.

COLLEGE BOYS AS TRACK LABORERS

THE DRAIN OF the war upon the nation's man power has resulted in the extensive utilization of high school and college boys for manual labor. Even in the summer of 1917 large numbers of students were recruited for farm work. Last spring, when the Chicago, Burlington & Quincy was in the market for track labor it occurred to Thomas E. Pratt, chief special agent, who is in charge of that work, that school boys might be used as advantageously by the railroads as by the farmers. Accordingly he visited the University of Chicago and presented to the young men there the advantages of

STUDENT TRACK MEN BEFORE THEIR CAMP

spending their vacations in useful employment for the benefit of the country and incidentally to their own financial and physical advantage.

As a result of Mr. Pratt's efforts about 75 University of Chicago students spent the summer working as track laborers on the Burlington. The men were given free transportation in tourist sleeping cars from Chicago to the scene of work and return, as well as free meals en route. Under the terms of the agreement effected with them their compensation was fixed at $2.50 per day plus any increase that might later be authorized by the Railroad Administration. While at work they were given free lodging in repainted and refinished bunk cars. Each car contained eight bunks, one bunk to a man, supplied with mattresses and blankets, and two cars were fitted with shower baths. A kitchen car in charge of a chef provided board to the men at the rate of $5.25 per week.

The majority of the students arrived at Alliance, Neb., on June 20, and commenced work under a track foreman of the road at Antioch, Neb., the following morning. Most of the men continued at the work for a period of 60 days and a few even longer. They worked over the line from Alliance, Neb., northwest through Wyoming to Billings, Mont., and from Billings southwest through the Big Horn valley to Casper, Wyo.

Every effort was made by the management to make the work congenial and pleasant for the young men. On Sundays they were given an opportunity to attend church and on days when weather conditions did not permit work they were allowed to seek amusement in nearby towns. While most of the students were young men who are working their way through college, a number came from wealthy families. Forty-five of the men

were students in the College of Arts and Sciences and the remainder came from seven other departments of the university. Three of the young men are specializing in medicine, four in law, six in chemistry, five in commerce and four in physics.

The employment of these young men not only disclosed their adaptability to track work, but the hard work in the invigorating climate of the foothills and mountains and the discipline and association with practical railroad men proved as beneficial to them as the strenuous physical training which they underwent.

LETTERS FROM OVERSEAS

"OUR WORK on the light railways," writes a lieutenant in the Fourteenth Engineers, "is becoming more fascinating as we get deeper into it. The volume of traffic is constantly increasing, and at the present time we are able to handle little but ammunition and supplies. Car shortage seems to be our chief difficulty.

"In places our track runs up to within 500 yards of the German front line trenches, and it is quite a ticklish job to take a train up there at night without lights, get it unloaded and get away again without being detected. As soon as the enemy discover a train they begin to drop shells, or pepper them with machine-gun fire. One night recently one of our men had the track blown out in front of him; he started to back up and another one landed just back of him and there he was marooned. He jumped into a shell hole and waited until things had quieted down, then crawled out, went to the nearest control station, got out the trackmen, fixed up the track and got away safely. Another night one of our men stopped his tractor and stepped down into a dugout to get some water; while he was gone a shell landed, and when he came out his tractor was scrap. However, such occurrences are the exception and not the rule.

"We have considerable trouble with the 'tanks' crossing our tracks at the most unexpected places, and you can imagine what it does to our track. One night recently one of our troop trains struck a tank which was crossing the track without lights. The train came to a dead stop, the impact throwing the engineer and fireman out on the ground, slightly stunning them. The 'tank,' however, did not stop, but continued on its way, and as soon as it cleared the track, up starts the engine, breaking away with one car, and before anyone realized what had happened was running wild down the hill. After running wild for a couple of miles she turned over in the ditch. Fortunately no one was seriously injured.

"It is truly marvelous what they have done with camouflage and what they are able to conceal with a little paint and fixings. The other day I was walking along the track, little dreaming that there was a gun within sight, when a big 12-incher let go within 100 yards of me. Well, for a minute I thought that I had been shot, so great was my surprise. There was not a bush or tree in sight, yet so successfully was it concealed that one would never see it unless one knew it was there."

The following is from a letter by a lieutenant in a shop regiment: "The French workmen start work at 6:00 a. m., or rather about 6:15, and do about three hours' work between 6 and 12. At 12 they start to go home, or rather they start to go home at 11:45, and do not return until 2:00 p. m. Work starts at 2:10 p. m. and continues until about 7 p. m. Altogether about five hours of work in a really good shop is all they do in the entire day, but they do it right. The ashpan is just as carefully fitted up as the valves.

"These locomotives are in splendid condition—they run as smooth as an eight-cylinder automobile—not a pound anywhere. The French workmen go at exactly the same pace as in peace time and they spend just as much time in polishing the ashpan and putting inlaid patches on the bumper beam as they ever did. In this little shop there is enough copper and brass to supply a whole railroad."

The following from a letter by Lieut, J. W. Kern, Thirteenth Engineers, gives some idea of French practice in maintenance and construction: "In taking over the line assigned to us, and operating strictly under French rules, the first thing that struck us was the simplicity of their operation. Great care had to be exercised to overcome a tendency toward what might be termed "contempt" for methods which seemed so far behind our own. As time passed, however, and officers and men had occasion to apply these methods, their merits became abundantly apparent. Coming from a live American railroad where trains are run by such different methods from those we found here, most of us found that one virtue we had to acquire, if it was not already possessed, was patience—and this is applicable not only to train operation, but to everything we have to do.

"The French are capable of respect for the most minute details. Their construction and maintenance standards are, in many features, woefully behind our own, but are quite adequate for the requirements. In construction they invariably pay the most careful attention to drainage, and their cut-slopes are conformed to section in a manner that is particularly pleasing to the eye. I have been astonished to see borrow pits neatly excavated, the slope cut to true line, and the material removed to a uniform depth without a semblance of raggedness or unsightliness—this care is evident in everything they do.

"On the roads I have seen, the rail used is about the same type as American rail. They employ the chair rail to some extent, but it is becoming rare. The new rail delivered corresponds very nearly to our 7506 and 9020 patterns in weight, although the section resembles somewhat the 'Frictionless' section employed to some extent on the Illinois Central, in that the head is narrow and high. Screw spikes are used, the cut spikes being unknown. Ties, practically all of soft wood and treated, are adzed and bored for different sections of rail before they are delivered for use. The adzing, effected by machinery, and a method which appears to be a most excellent feature of maintenance, inclines the head of the rail toward the center of the track. Six screw spikes are used per tie, with two inside the rail and one out on alternate ties, and vice versa. Flange wear on curves is practically negligible here as compared to what we have in America. Wide gage, though not uncommon, is not what might be expected in the absence of tie plates which are very rare. The lightness of equipment is responsible for this, line and surface being quite easily maintained. The switches are much the same as our common split type and are very carefully built. Owing to the adzing and boring of the ties, each switch tie must be spaced with precision, and consequently switches are usually built complete before being lined to place in the track."

RIVER TRANSPORTATION.—A towboat and three steel barges carrying 2,200 tons of grain and miscellaneous freight left St. Louis, Mo., on Saturday, September 28, for New Orleans, La., inaugurating government transportation service on the Mississippi river. The equipment at present consists of 5 towboats and 30 steel barges, but contracts have been let for the construction of six additional steamers and 40 steel barges for service on the Mississippi and Warrior rivers at a total cost of $6,170,000.

A Convention Group on the Opening Morning.

BRIDGE AND BUILDING MEN MEET IN CHICAGO

The Material Situation, Essential Work, Carrying Structures Over and Labor Problems Are Considered

THE TWENTY-EIGHTH annual convention of the American Railway Bridge and Building Association was held at the Hotel Sherman, Chicago, on October 15 and 16. While the meeting was held under adverse circumstances culminating in the widespread epidemic of Spanish influenza which kept many members home, the registration of 125 has been exceeded in only three previous years. The papers and the committee reports which were presented were prepared to meet the most pressing problems of the day. They were, therefore, of a particularly practical nature.

The officers of this association for the past year have been: President, S. C. Tanner, master carpenter, B. & O., Baltimore, Md.; first vice-president, Lee Jutton, division engineer, C. & N. W., Chicago; second vice-president, F. E. Weise, engineering department, C. M. & St. P., Chicago; third vice-president, W. F. Strouse, assistant engineer, B. & O., Baltimore; fourth vice-president, C. R. Knowles, superintendent water service, I. C., Chicago; secretary-treasurer, C. A. Lichty, purchasing department, C. & N. W., Chicago.

The meeting was called to order by the president at ten o'clock Tuesday morning, the usual addresses of welcome and president's address were dispensed with. The report of the secretary-treasurer showed that approximately 40 new members had been received during the year and a balance on hand in the treasury of $1,044.

REPORT ON REPAIRING AND STRENGTHENING OLD MASONRY

It has been considered advisable to refer to the report submitted by the masonry committee of the American Railway Engineering Association in 1911, in which the more common causes of masonry failure are given. While this report deals particularly with concrete construction, it is applicable in its essential features, to all classes of masonry. The following causes are mentioned:

(1) Faulty design: (a) Where masonry is placed on a grillage above the water line, or where the water level is lowered after construction, causing the grillage to rot and allowing the masonry to settle. (b) Where the grillage rests on piles and where the designer used too high a stress for timbers in compression. (c) Where the wing walls of U-abutments were built too light. (d) Where the designer used too high a bearing pressure on the earth, or bearing piles. (e) Settlement of the body of a structure, causing cracks to appear where the wings leave the main portion of the structure or, in the case of arches, at points back of the parapets. (f) Lack of proper drainage.
(2) Poor material or poor workmanship.
(3) Temperature cracks.
(4) Disintegration of the masonry: (a) On account of alternate freezing and thawing of exposed surfaces; (b) on account of exposure to salt water, alkalies, acids or heat.
(5) Improper filling.
(6) Scour: Caused by, (a) freshets, (b) driftwood, wagon bridges, etc., lodging against the masonry, (c) ice gorges, or (d) inadequate waterways.
(7) Sliding material.

FAULTY DESIGN.—If settlement resulting from faulty design, cases (a), (b) and (d), is not uniform in large structures they will probably crack unless reinforced to prevent settlement cracks. If the abutment were built in sections, the different sections would be divided by vertical planes and prevent unsightly cracks.

In the case of arches (f) under high fills and supported on ordinary soils it is difficult to prevent cracking of the abutments and ring unless reinforcement is used, on account of the pressure on the foundation in the center of the arch being much greater than at the ends of the wing walls.

POOR MATERIAL OR POOR WORKMANSHIP.—Failures from these causes can be avoided by proper care. Portland cement as now placed upon the market is very reliable and few failures can be traced to this ingredient. The use of dirty sand or a poor grade of stone generally rests with the engineer. Workmanship cannot be controlled as readily where inefficient or unskilled labor is employed. However, a competent inspector can generally get satisfactory results.

TEMPERATURE CRACKS.—Temperature cracks will usually occur in long walls, although some railroads report uncracked abutments built of plain concrete in lengths of 60 to 100 ft., and of reinforced concrete in lengths of 150 ft. Expansion joints are generally introduced at intervals of from 40 to 50 ft.

DISINTEGRATION OF THE MASONRY.—Disintegration, case (a), can be prevented in arches and to a great extent in abutments and retaining walls by proper waterproofing. However, very little protection to exposed surfaces can be provided beyond the use of the most durable material available, placed in a thoroughly workmanlike manner.

IMPROPER FILLING.—A properly designed monolithic structure will resist failure, due to careless or improper filling better than a structure built in sections. This is another instance where proper inspection and supervision can be exercised to good advantage.

SCOUR.—In designing structures over streams the size of openings should be such as to take care of the maximum amount of water that is likely to come to the opening. Should the scour extend below the foundations, the structure is liable to settle forward or downward

bodily. A monolithic structure will resist failure better than one built in sections, but cracks are liable to occur in either event. Complete failure in many instances can be prevented by relieving the pressure at the back or placing struts across the opening.

SLIDING MATERIAL.—A properly designed monolithic structure will resist failure due to sliding material better than structure built in sections.

It is a fact that many masonry failures are not due to any of the seven causes mentioned, but to overloading the structures. Very positive proof of this assertion can be found upon looking into the history of two of the oldest masonry structures on the Baltimore & Ohio.*

The most remarkable feature surrounding these old bridges is the fact that, when they were designed, the equipment in use was undoubtedly lighter than the present day automobile truck. Notwithstanding this fact, they are to-day carrying as heavy traffic as any bridges in the country, and bid fair to continue to meet growing demands for many years to come. They stand as monuments to the engineers in whose minds they had their inception.

J. P. Canty, division engineer of the Boston & Maine, advises that the custom on that road of repairing old stone masonry has been confined almost wholly to raking out the joints and pinning and pointing them, or in some cases simply pointing. When the masonry is in such condition that this method will not be effective and economical it is torn down and rebuilt, although in some cases structures have been saved by buttressing and reinforcing bulging or otherwise defective masonry, with iron or concrete, or both.

One case in which the above method was employed consisted of a comparatively large stone arch over a stream in which one flared wing about 75 ft. long, bulged to such an extent at the center about midway between the top and bottom, as to make the road uneasy about its safety. This wing was about 35 ft. high where it joined the spandrel wall of the arch and was stepped down from full height near the track, to a height of 4 or 5 ft. at the outer end. In this case about 15 wooden piles were driven in two rows in front of the wing where the maximum bulge was located. These piles covered a rectangular area about 8 ft. wide and 16 ft. long parallel to the masonry. They were enclosed by a wood cofferdam, which was unwatered and the piles cut off at the water line. The cofferdam was then filled with concrete, and scrap track rails, set vertically at about 2 ft. centers, close to the old masonry, were embedded in it. A block of concrete was then cast, encasing the rails battering from the outside line of the cofferdam to a width of about 3 ft. at the level of the maximum bulge. No movement of the masonry has been noted since this was done about two years ago.

*The structures referred to are the Gwynn's Falls arch and the Thomas viaduct over the Patapsco river, near Baltimore, Md. They were described in the *Railway Maintenance Engineer* of August, 1917, page 245.

S. C. TANNER,
President

In another case, the crowns of two 20-ft. three-centered double track stone arch spans, laid dry, began to flatten, although the abutments, pier and wings showed no evidence of movement or distress. Repairs to this bridge were made by building a temporary wooden deck under the tracks, which were only three or four feet above the crown of the arch rings, this deck being supported on pile bents back of each abutment and a timber bent over the pier. This construction permitted the removal of the earth filling and ballast from the tops of the arches.

Centers made to fit the original curve of the arches were placed under them and the deformed arches were jacked back to the original shape and position. All joints were washed out clean and thoroughly grouted with cement. An examination of the structure disclosed the fact that the thickness of the abutments at the springing line was not sufficient to stand the thrust of the arches and additional concrete was added to provide for this. This work was done about 10 years ago and no settlement has since been noticed.

Stone masonry piers which showed evidences of failure have been repaired and strengthened by placing track rails in pairs, vertically on each side of them, tied toegther by placing rods through the piers between each pair of rails, and secured to the rails by heavy bent washers on the outside of the rails, with nuts on each end of the rods. The entire piers were then encased in concrete 12 in. to 18 in. thick and have since given satisfaction.

Repairs to high spandrel or parapet walls on old stone arches carrying single or double tracks which have been pushed out by the increased weight of rolling stock, have been repaired by drilling holes in pairs through the spandrel walls opposite each other about four feet below the tops of the ties and providing tie rods about 1½ in. in diameter. These rods were anchored to the faces of the walls by pairs of rails or by heavy iron plates. Nuts or turn buckles were then screwed tight and the rods encased in concrete.

Repairs to concrete masonry have been made by cutting out the defective concrete and replacing it with good material.

W. F. STROUSE, assistant engineer, Baltimore & Ohio, Baltimore, Md., chairman.

DISCUSSION

The discussion of this report indicated the belief that masonry is frequently condemned when it could be repaired at comparatively small cost. L. D. Hadwen (C. M. & St. P.) emphasized the old adage "that prevention is better than cure," stating that masonry does not receive as careful inspection or as much attention as a steel structure. Steel structures are commonly strengthened as soon as they give indications of overloading, but masonry is allowed to carry traffic much heavier than that for which it was designed until it shows signs of

failure before being given relief. He also emphasized the importance of providing adequate drainage in the embankments back of the structures to permit the escape of water promptly.

A. Montzheimer (E. J. & E.) described the reinforcement of a center pier of a double track drawbridge crossing the Calumet river at South Chicago, Ill. This pier was supported on piles cut off well below the water line, but extending several feet above the bed of the river. This form of construction gave rise to serious vibration and to provide a more stable structure, it was decided to enclose the piles in concrete. A cofferdam of steel sheet piling was driven around the pier and additional piles were driven inside this cofferdam, after which it was filled with concrete. This form of construction greatly increased the stability of the pier and rendered further reconstruction unnecessary.

Lee Jutton,
First Vice-President

F. E. Weise,
Second Vice-President

W. F. Strouse,
Third Vice-President

C. R. Knowles,
Fourth Vice-President

ESSENTIAL WORK

By C. A. Morse

Assistant Director, Division of Operation, United States Railroad Administration

Possibly local conditions make it necessary that there should be some variation in the methods employed in the maintenance of bridges and buildings in different parts of the country, but in the majority of cases there is no reason why one should not follow a standard practice. Some men are still line spiking ties on pile and timber trestles, and are not convinced that this is not the best practice. Some are still dapping guard rails and insist it is the only proper method. Possible some are still using a mortise and tenon on framed trestles. We all know that there is more variety in bridge practices than is necessary, and more than any one road would follow on its different divisions. All who are connected with roads taken over by the United States Railroad Administration are now in the employ of one management, for the time being at least; and it should be the endeavor to standardize the methods of bridge work on this consolidated railway.

We all know that it is possible to extend the life of pile and timber trestle bridges indefinitely by replacing each year the separate items that go to make up the structure. Also, while in ordinary times it has been considered wise to renew a structure completely when it has reached a certain stage, using the salvage for repairs that would otherwise require the purchase of new material, with both labor and material obtainable only in limited quantities, and knowing that we can carry a structure over for another year with perfect safety by only making partial renewals it is up to us to do so. Again we are using large quantities of treated material, especially creosoted material. To-day it is impossible to get creosote in sufficient quantities to fill our requirements, and to renew bridges completely with untreated material means a comparatively short-lived structure. In repairing structures to extend their life from one to five years, we should use untreated material, as it is much easier to secure it than the other.

A few years ago railroads could borrow money at 4 per cent to take care of additions and betterments and under those conditions it was not economical to spend over 4 per cent of the cost of renewal in repairs that would extend the life of the structure one year. As labor and material were costing much less then than now, this did not permit extensive repairs to be made.

However, to-day money for additions and betterments expenditures is costing from 7 to 10 per cent, and labor and material, when they can be had at all, are from 50 to 200 per cent higher than they were a few years ago. These conditions are due to the war, which we all hope and believe cannot last over one or two years longer at the most, when they will be changed. Therefore, we are warranted in making large expenditures for repairs at this time, especially for those that will extend the life of the structure until after the war, when renewals can be made for probably 25 per cent and possibly 50 per cent less than at this time.

It behooves us, therefore, to make a careful inspection and study of each and every structure, and if we can repair it so as to make it good for perhaps four years, for 40 per cent or 50 per cent of what it would cost to renew it in full, we should make the repairs. If we can make repairs that will extend the life of the structure one year for, say, 7 per cent, two years for 8 per cent per year and three years at 9 per cent per year of the cost of renewal, such repairs should be made. It will be seen that if this policy is carried out carefully we will be able to get through next year with few, if any, full renewals of pile and trestle bridges, and that in doing so there will be a great saving in both labor and material, and especially in the latter.

The same careful inspection and study should be made of steel structures. In the first place, they should be kept well painted, as nothing gives added life to a steel bridge

for so little money as this. Many structures that are a little light can be taken care of by strengthening if on important main lines, and by reducing the speed of trains on less important lines.

We are all ambitious to improve the class of structures on the territories under our jurisdiction, and rightfully so, in ordinary times. We all have our schemes for strengthening structures to permit heavier wheel loads from which economical operation can be secured; all of which is perfectly proper and laudable, but in times like the present we must put such work on the shelf and bend our efforts toward holding what we have, leaving such things to be done when we are not fully occupied in the one great task of winning the war. We can afford to stop the wheels of progress temporarily, for if we do not win the war, there will be nothing to make progress for.

We all have waterways that are not large enough for the area drained. Many of these have been in this condition for years. We naturally are trying to remedy them a few at a time, and rebuild some each year, but we should not do any of that class of work during these times unless they are cases where washouts have occurred recently, and then only if we find that there have been previous washouts at these same places within the last two or three years. We can afford to take a chance where this is the only washout at that point for 6 to 10 years, and hold up the work until labor and material conditions have improved.

C. A. LICHTY,
Secretary-Treasurer

On building work the question of replacing old depots is usually up to the management, and as there is little chance of state or local authorities making demands for better depots at this time, repairs to present structures is about all that yau have on that class of structures. While you cannot do much new building work, you should endeavor to keep the present structures painted, both for looks and to extend their life. This applies not only to structures, but to roadway signs, for in keeping the latter well painted you add to the safety of operation. Signs are erected for a purpose; in order to serve that purpose they must be seen, and a well painted sign is more readily seen and attracts attention quicker than an unpainted, weather-stained sign, that looks as though it was obsolete and was there only because someone had neglected to take it down. The actual cost of painting roadway signs is small, while there is nothing on a railroad that makes it look more alive and up to date than well-painted roadway signs.

Mechanical department buildings are constantly requiring replacement because of the increased size of power, and there is little opportunity for the bridge and building department to do anything in the way of controlling expenditures along that line. There is, however, one thing in connection with buildings in which these men do have it in their power to make a great saving; that is in connection with the heating. It is surprising to see how little attention is paid to keeping depots and mechanical buildings like shops and roundhouses tight so as to keep *out* the cold and keep *in* the heat.

Good work can also be done in keeping steam, water and air pipes and valves tight and preventing leakage, which means fuel for pumping water and air, and the making of steam; there is no comparatively small maintenance matter where so much can be saved as this. With the coal situation as serious as it is in this country to-day, a special effort should be made to do everything that will tend to conserve fuel. Steam pipes should be lagged, windows and doors should have weather strips, floors should be kept tight, and the bottoms of buildings where cold can get under floors should be boarded or banked up, broken window panes should be replaced promptly and every effort should be made to save fuel. In many cases in the northern climates double windows and storm doors should be provided.

In many sections of the country, and probably on nearly every line of railroad, there still remain some wooden platforms at depots. As these require renewal, they should be replaced with earth embankments where any appreciable amount of filling is necessary, and these embankments should be covered with stone screenings, gravel, cinders or something of that class (where little or no filling is required the earth can be omitted), and do away with the use of wood in these platforms. This applies to platforms at small stations where it is not planned to put in brick or concrete.

I always associate a master carpenter with the old time freighter, who has a "Jockey Box" on the back of his wagon, in which could be found anything from baling wire to a wagon hammer. If anything happened on the road he could always find something in his "jockey box" with which to repair it. A master carpenter's headquarters shop, together with outlying buildings, is usually a big "jockey box," from whch he can dig up something with which to do any ordinary job without waiting for the material ordered on the requisition to show up.

If you have not already found it necessary to do so, I would suggest that, regardlees of the nature of the "jockey box," in these times of conservation, you clean out the box and get all of this material into use. This is no time to have material lying around idle, with the idea that it will come in handy some time; now is the time when it should be used. Some of the things that accumulate on a brdge and building foreman's hands are packing, O. G. washers and chord and sway brace bolts. This is especially true where wooden bridges are constantly being replaced with concrete structures or pipe. I have noticed that it is hard to separate a foreman from this class of material, but all surplus material of this kind and all metal scrap should be shipped into the storehouse now while materials and scrap are so valuable.

Second hand system material yards should be inspected carefully; material that can be used for strengthening bridges should be kept; girders and I-beams that can be doubled up, should be listed and used as soon as possible and the balance should be scrapped.

It has been customary to save a lot of light girders and pony trusses for possible future public road crossing use. I believe we are warranted, at present prices, in scrapping all such, as we will probably be able to buy new spans, designed for road crossings, by the time we would use these, and get them for less or at least no more than we can get for these as scrap at this time.

My thought is that, with the present high prices for all material and scrap, a special effort should be made to clean house, using what is usable and selling the balance to get rid of it. We can then start with a clean slate when normal times come again.

One of the bridge and building foreman's fads is

"jacks" and if left alone each foreman will have a jack of every size he may possibly have use for, if only once in five years. Every time he has use for a certain size or style of jack he makes a requisition for it, and if times are good and there is much work going on, nine times out of ten he gets the jack regardless of the fact that some other foreman on the division has one like it lying idle.

There is always an accumulation of odd sizes of timber which are not standard. Now is the time when bridge engineers, architects and master carpenters should get a list of this material from the store department, and, regardless of standard, plan buildings and odd structures so as to use it up. By doing this they will get rid of a lot of dead stock and convert it at a very high price. There is usually an accumulation of window frames and sash, door frames and doors, window weights, etc., that should also be used. Glass is high like everything else and by getting after it now we can use it at this time, and by so doing clean up all of the odds and ends. The same process should be applied to anything that the store department has on hand that is not being called for, because it is not standard practice for the time being on the particular road. Material is too scarce and costs too much money in these times to be finicky about standards.

THE MATERIAL SITUATION

Following the presentation of Mr. Morse's paper, Hermann Von Schrenk, consulting timber engineer, St. Louis, was called on for a discussion of the material situation with reference to the supply of timber ordinarily used in bridge and building work. He stated that the condition is much more acute now than a year ago owing to the demands of the war department and the shipping boards for both treated and untreated timber. He urged the curtailment of the demands for repair and renewal purposes as much as possible and suggested a number of expedients to extend the life of timber, such as the placing of salt boxes on piles. He also emphasized the necessity of using native timbers as far as possible to reduce the demands for transportation and stated that the present conditions now make it necessary to use many timbers not considered desirable before. He also called attention to the necessity of providing closer inspection of bridges as a precaution against fire, as this hazard becomes greater with the increased age of the structure.

COMMUNICATION FROM T. C. POWELL

Following Dr. Von Schrenk, a communication was read from T. C. Powell, a member of the Priorities Committee of the War Industries Board, on the work of that organization in conserving steel. The following abstract is taken from this letter and from accompanying circulars:

The nation's present business—your present business—is war. When this fact shall have taken firm root in the hearts and minds of the men, women and children of this country our industrial problems will be found comparatively easy of solution, and the task of readjusting and mobilizing the industries of the nation to meet the requirements of the military program more than half discharged.

For the winning of the war steel is now the world's most precious metal. It is consumed, or used to some extent, every day by practically every civilized man in every civilized country and nowhere in such vast quantities per capita as in the United States. The present and constantly increasing steel requirements of this country and its allies for direct and indirect war needs, 100 per cent of which must under any and all circumstances be promptly supplied, are so enormous as to well-nigh absorb our constantly expanding producing capacity. The result is obvious. There will be comparatively little iron and steel left to distribute to those industries engaged in non-war work and to consumers for application to non-war uses. Every possible use of iron and steel or their products which can be deferred must be deferred until after the war. This duty is personal and cannot be avoided or delegated to your friends and neighbors. No consumption is so small as to be immaterial, and no saving insignificant. Every pound collected and sold to scrap iron dealers finds its way back into the general supply of iron and steel. "The last quarter hour will win the war," and in that quarter hour the last shell will be fired. That shell may be made from steel that has been saved through the collection of scrap or through denial of the luxury of purchasing steel in the form of articles which have come to be regarded as peace-time necessities.

Among other tasks which the President has laid upon the War Industries Board is that of so distributing the supply of iron and steel available, or which can be made available, as to meet the war requirements and as far as possible the essential needs of the civilian population. This task is being discharged in part through the administration of priorities.

The term "priority" implies discrimination—purposeful discrimination. All priorities are relative and the classifications are based upon the relative importance of the particular industry or the particular plant involved to the war program or to supplying the essential needs (as distinguished from wants) of the civilian population.

That all interested in the manufacture and sale of building materials as well as those interested in building projects of every character may have a clear definition of or a ready means of ascertaining the uses to which such materials may be put and be advised of approval of the War Industries Board, the following classification of work has been prepared. Structures, roads or other construction projects falling within the following classifications are hereby approved and no permits or licenses will be required therefor:

(1) After having first been cleared and approved by the War Industries Board, those undertaken directly by or under contract with the War or Navy departments of the United States or the United States Shipping Board Emergency Fleet Corporation, the Bureau of Industrial Housing and Transportation of the United States Department of Labor or the United States Housing Corporation.

(2) Repairs of or extensions to existing buildings involving in the aggregate a cost not exceeding $2,500.

(3) Roadways, buildings and other structures undertaken by or under contract with the United States Railroad Administration or a railroad operated by such administration.

(4) Those directly connected with mines producing coal, metals and ferro-alloy minerals; and

(5) Public highway improvements and street pavements when expressly approved in writing by the United States Highways Council.

No building project not falling within one of the foregoing classes shall be undertaken without a permit in writing issued by or under the authority of the Chief of the Non-war Construction Section of the Priorities Division of the War Industries Board.

The Priorities Division has two divisions, one supervising construction, which is immediately connected with the prosecution of the war, and the other, the construction which is non-war.

The division in charge of non-war construction not only supervises the amount of steel necessary for such

construction, but also carries out the plan under which no construction costing above a certain sum can be started without a permit. This division has also undertaken to secure a report from the entire country listing all the building now in progress, including private residences as well as manufacturing plants.

It is recognized that in certain types of construction steel is an essential material, but the Facilities Division does not accept the mere statement that the style of construction decided upon necessarily requires steel, but goes further into those projects to develop whether or not the type of construction cannot be changed without incurring additional expense and by substituting other available materials, the use of which will conserve steel. The same program is carried out in connection with railroad construction, and in many cases the plans of the railroads, or of contractors working for the railroads, have been modified, substituting concrete for steel, and in some cases substituting wood for steel.

In the case of bridge construction, the railroad submitting plans for a new bridge or the replacement of an old one, is asked to limit the use of steel to the minimum. In the case of shop buildings, the steel is limited to those parts of the building for which it is proved that no other type of construction is possible. Water tanks and fuel oil tanks are now also being constructed of concrete.

The conservation of material and men is an absolute necessity to the ultimate victory of the Allies. Not only must men and materials be conserved, but the use of the railroad facilities must be limited to necessary transportation and all unecessary use of the transportation facilities must be cut off. The less waste there is in transportation, the more engines, cars and track facilities will be available for handling troops, munitions, food and the necessary materials.

It is believed that with the co-operation of the people of the country there will be provided a reserve supply of men, materials and railway facilities, and I think we are all firm in the opinion that the existence of this reserve power will be the deciding factor in bringing the war to a complete and satisfactory conclusion.

REPORT ON SOURCES OF RAILWAY WATER SUPPLY

Two essential features of almost equal importance must be considered in the selection of a railway water supply: quantity and quality. It is obvious that the supply must be sufficient in quantity, but secondary only to an ample supply is the question of quality.

The successful operation of a railroad using steam as a motive power requires that the supply of water be equal to the demand at all times. The consumption will vary greatly and the available supply should be sufficient for the maximum requirements, with a safe factor to provide for future increased consumption. The quantity of water required is dependent on the number and size of the engines taking water, the tender capacity of the engines, the tonnage of trains and the distance between stations. Provision should also be made for water for other than locomotive supply at terminals and other points where such water is required. The immediate supply should be sufficient for a demand at least 50 per cent over the normal requirements to provide for fluctuations in consumption and extraordinary movements of trains following temporary obstruction of traffic or for any other reasons.

In considering a source of supply accessibility is secondary to the quality of the water. An ideal water for locomotives is one that will not form scale or cause corrosion, pitting or foaming. Unfortunately, nature does not supply a water entirely free from these effects, but in many cases they can be minimized by a careful selection of the supply. Consideration should always be given to the quality of the water rather than to the convenience of location.

No figures are available as to the sources of water supply of American railroads, but the following statistics concerning municipal supplies are given by the U. S. Geological Survey, quoting from the Journal and Engineer, Vol. 24, No. 19, May 6, 1908: "In nearly 400 cities located in all parts of the United States and Southern Canada, 40 per cent of the public water supplies are drawn from wells, 25 per cent from lakes, ponds or springs, 24 per cent from rivers, and 11 per cent from mountain streams impounded or otherwise. In 56 out of the 93 cities in the Ohio river valley, and 46 out of 85 cities in the Upper Mississippi river valley water supplies are derived from wells. Of 131 cities in the New England and middle Atlantic states 56 take their supplies from lakes or springs, 28 from wells, 26 from mountain brooks, and 21 from rivers. The total volume of water taken from other sources is, of course, greatly in excess of that taken from wells."

While municipal water supplies are used for domestic purposes rather than for boiler supplies, the various sources of municipal supplies may be taken as a fair average of the sources of water used for railway purposes, for the reason that the railroads are compelled to look to the same sources of supply as the municipalities through which they operate, in many instances taking their supply from the cities and towns along their line.

STREAMS

Small streams, if sufficient in quantity, present but few difficulties in establishing a pumping station. On rivers and the larger streams, where the stage of water varies beyond the limits of ordinary suction lift the proper location of pumps with reference to the varying stage of water is essential to satisfactory operation. The pumps are sometimes placed in waterproof pits within easy suction lift of the water at the lowest stage. Also facilities are sometimes provided for raising and lowering the pumps with the varying stages of the stream. The former method is the better, as, where the pumps are moved with the river stages, the station is little more than a temporary affair, and the costs of operation and maintenance are excessive. Streams usually carry considerable matter in suspension and the problem of protecting the intake lines from mud, sand, leaves, etc., is quite important. The matter carried in suspension by the water of streams may be removed readily by settling basins or filtrations, and the water is usually of a good quality except where the streams are polluted by sewage or industrial wastes. Smaller streams are often affected by organic and vegetable matter, especially after a prolonged dry period followed by light rains which bring the troublesome matter into the streams, but do not flood the streams sufficiently to carry the impurities away. This condition accounts for a great deal of the trouble experienced from foaming and pitting, by water that is usually considered a good boiler water.

When the supply is from a small stream, whose normal flow falls below that necessary to supply the demand during certain seasons, it is frequently necessary to build impounding reservoirs in which to store the heavy spring and fall flows for use during the low periods of summer and winter. If the pump capacity is in excess of the flow, damming the stream will permit of securing the

full supply by running the pump only a portion of the time and at convenient periods instead of constantly.

LAKES

The smaller lakes and ponds usually offer the most favorable conditions for establishing pumping stations, both as to construction and quality of water. They are affected but little by storms, and difficulties from the effects of currents common with the larger lakes are not encountered. While the quality of the water of the large lakes is uniformly good the effects of currents and storms sometimes cause a great deal of trouble from turbidity and sewage pollution, as well as stoppage of intakes, if they are located near the shore. Few, if any, intakes of railway water stations are located very far from shore or breakwaters, and as the shores of lakes in the vicinity of cities are constantly being extended, chiefly through the dumping of rubbish, these intakes are a continual source of trouble and expense. The intake of one railroad pumping station in Chicago, pumping from Lake Michigan, has been relocated four times and extended 200 ft. in 10 years. Where the water was 18 ft. deep 10 years ago it is now 3 ft deep and constant care is necessary to keep the intake from being covered by rubbish. During stormy weather or periods of inshore winds a large force of men is required to keep the intakes and strainers clean. As much as 20 tons of material has been removed from this intake in 10 hours. This condition has been brought about by the dumping of rubbish by the city and emphasizes the necessity of extending intakes well out in the lake, where they will not be affected by conditions along the shore.

RESERVOIRS

Impounding reservoirs are frequently found necessary for the storage of water when a suitable supply is not available from other sources. The most economical and satisfactory method of constructing an impounding reservoir is by damming up a valley if one may be found suitable for the purpose. The cost of excavating for a reservoir or constructing it entirely of stone, brick or concrete is prohibitive where the storage of several months' supply is required. Where the reservoir is dependent either on a stream or water shed for supply, the storage should be sufficient to provide for the evaporation and absorption that will take place in addition to the normal consumption. The evaporation will vary greatly with different reservoirs. The factors to be considered are the humidity, area of reservoir, depth of water, temperature, proximity of forests and other local conditions. The absorption will depend entirely on the character of the surface and sub-strata and unbroken sub-strata of clay or hard pan form the best possible bed for a reservoir as the absorption through a formation of this kind is less than through any other than an impervious rock. Where a limestone formation prevails, care should be taken to see that there are no sinkholes or fissures in the submerged area through which the water might escape. The rainfall will have to be considered carefully in connection with the watershed to determine the catchment area required. The size of spillway will depend on the rainfall and catchment area and should be large enough to take care of the maximum run off over the entire catchment area.

The care of the catchment area or watershed is an important factor in determining the quality of water secured from a reservoir. The most effective method of protecting the quality of an impounded water supply is to purchase the entire catchment area. This is hardly ever practical, or possible, the chief objection being the cost, as the water shed will usually cost many times more than the reservoir. The desired result may be accomplished in most cases by acquiring all the land around the reservoir within a certain distance of the water's edge. If this strip is kept well sodded it will assist materially in improving the quality of the water, as it acts as a strainer or baffle, and prevents impurities entering the reservoir. In preparing a reservoir site for water, it is very important that all timber and plant growth be removed from the flooded area to prevent contamination of the water through certain forms of vegetable life commonly known as algae.

The dam is perhaps the most important feature in connection with an impounding reservoir and too much attention cannot be given to its construction. The foundation must be sufficiently firm to prevent the settling of the dam. The connection between the foundation and the dam must be of the best to prevent leakage and shifting, or sliding, as, if the connection is not good, a part of the dam may slide out under pressure. Dams are constructed of various materials, such as wood, concrete, stone and earth. Earthen dams are most commonly used on account of their cheaper construction, and when properly built are quite as satisfactory as any other construction. There are several different methods of preventing leakage through, or under the embankments of earthen dams, the one most employed being a puddle wall carried from several feet below the base to the top of dam. The thickness of the puddle wall depends on the height of dam. Other methods of preventing leakage and strengthening the dam are to drive a row of sheet piling through the center of the fill, or to construct a concrete core wall. Sometimes low retaining walls of concrete are placed along each toe of the slope, these walls assisting materially in preventing damage to the dam and adding to the appearance. The slope of the embankment will depend largely on the height, although it is usually carried 3 to 1 on the water side and 2 to 1 on the down stream side.

WELLS

A deep well is not always the most satisfactory method of securing water, as, where the head is far below the surface, the cost of raising the water is excessive, but surface conditions are often such that the only available water supply is that secured in this way. Well waters, as a rule, are pure and clear, although many are very hard. A hard water is not objectionable for drinking purposes, but is unsatisfactory for boiler use. The majority of well waters respond readily to treatment and as a well is usually drilled only when all other possible water sources have failed, there is no choice, other than to use the water in its natural state or resort to treatment.

An intelligent knowledge of the presence of underground water can be secured only by a careful examination of the locality in which the well is desired and of existing wells in the vicinity. From the existing wells and local geology, it is often possible to determine the exact depth of the water-bearing strata and the quantity of water it is possible to secure, as well as the quality of the water.

The ground water level has lowered decidedly in certain sections of the country. While this decline has not been confined to any particular section, it has been marked in Indiana, Southern Michigan, the Great Plains and in Southern California. It is also noted that an artesian well was drilled in Chicago in 1864 in which the water rose to a height of 80 ft. above the surface of the ground, or 111 ft. above the surface of Lake Michigan. The flow in this well has long since ceased and the head has declined until the water stands 20 or 30 ft. be-

low the surface, a loss in head of 100 to 110 ft. This loss of head may be accounted for in part through the reckless waste of ground water from flowing wells. A great part of this waste is from the casings of old oil wells. In many sections of the country, especially in Mississippi and Louisiana, hundreds of artesian wells are allowed to flow constantly to no purpose, wasting large quantities of the best ground waters. In the southern states, with the possible exception of Florida, this waste does not appear to have materially affected the ground level of the water, but it is only a question of time until the loss will be seriously realized.

The various types of wells commonly used in railway water service are hydraulic rotary wells, standard drilled wells, jetted wells, bored wells, driven wells and open wells.

C. R. KNOWLES, superintendent water service, Illinois Central, Chicago, chairman.

(Following the presentation of this report a monograph on wooden tanks was presented by C. R. Knowles which pointed out the increased importance of this form of construction under present conditions and gave detailed data regarding the designs ordinarily adopted and the service which various roads have secured from tanks of this material. An abstract of this report was held out of this issue because of lack of space and will appear in the December number.—Editor.)

INVESTIGATING OLD BRIDGES FOR HEAVIER LOADING

BY C. F. LOWETH*

Chief Engineer, Chicago, Milwaukee & St. Paul, Chicago

It was formerly the common practice to investigate all the light bridges involved when a new engine loading was up for consideration. Stresses throughout the structure for this loading were figured and a decision then made as to whether or not the load could be handled safely. Each time a new loading came up for consideration the process was repeated and little or no use made of the previous computations.

The present practice on the Chicago, Milwaukee & St. Paul is to make an investigation or "classification" of each structure. Its carrying capacity is determined in terms of the "Cooper" series of train loadings. New engine and car loadings that came up for consideration are also classified according to the "Cooper" loadings, and it is then a matter of direct comparison to tell whether such proposed loadings can be safely handled over the various bridges. Every bridge which is known to be, or suspected of being, overloaded is subjected to a careful stress analysis to obtain its "classification."

In making these classifications it is necessary first of all to establish the maximum unit stresses to which the various materials can safely be subjected, and in fixing upon these limiting unit stresses it is necessary to take into account (1) the character of design, (2) the character of the workmanship, (3) deterioration, (4) action under load, (5) the speed likely to obtain over the structure and confidence as to the observance of any speed restrictions that might be imposed, (6) the element of certainty as to the assumed loading being the maximum to which the bridge will be subjected, (7) importance of traffic and hardship which might result from temporary disablement of the structure, (8) the probability of early renewal on account of change of line, etc., (9) judgment based upon all of the factors surrounding the bridge, its location, service and condition.

*In the absence of Mr. Loweth, this paper was read by R. L. Stevens, assistant engineer, C. M. & St. P., Chicago, who had assisted in its preparation.

The general method of investigating any part of the bridge and making a classification is as follows:

1. The maximum allowable stress is determined, which, in the simpler cases, is the cross sectional area of the member multiplied by the limiting unit stress allowed.
2. Deduct from this the stress in the part due to dead load and windload. The remainder gives the allowable stress for the live load effect.
3. Divide this by the stress for unit live load (Class E-1), which gives the classification for allowable live load, if at rest (train standing on the bridge).
4. Divide this classification by the term which takes into account the extra effects of the live load, due to impact and contrifugal force, the result being the classification of the allowed live load at full speed.

STRENGTHENING BRIDGES

The strengthening of light bridges may be either a matter of reinforcing minor details, which are found to limit the carrying capacity of the bridge, or may consist of heavy reinforcing in an attempt to increase the strength of the structure throughout.

The minor strengthening can usually be done at small expense and is an economical method of getting considerably greater life out of bridges. Heavy reinforcing may or may not be economical, as it involves doing work in the field which is expensive, while the maintenance of traffic during the time the work is in progress, which involves some risk to traffic, is unusually expensive. On very large bridges, where the cost of replacing amounts to a very large sum, some very extensive strengthening operations have been carried out economically.

In making plans for reinforcing bridges, it is usually preferable to add new material to the structure so that the present structure is not temporarily weakened, rather than to remove parts and substitute heavier ones, though the latter has sometimes to be resorted to.

In plate girders the top and bottom flanges may be strengthened by additional cover plates, particularly at points where the web is spliced and not effective for carrying its proportion of the bending stress. Where there are no cover plates on the girders, cover plates of desired length can be added. On plate girders where there are two or more plates, additional cover plates would be nearly the full length of the girder and expensive to apply. Plate girders can be doubled up to make deck spans, using three or more girders per span at small expense, thereby using up light girders and providing bridges of large carrying capacity. Where waterways or other undercrossing conditions permit, timber bents can be placed under spans to strengthen them.

Where the rivets in the flanges of girders show low classification, larger rivets can be substituted for existing rivets, or, where the rivet spacing permits, additional rivets can be driven. Where the web plates give a low classification, additional stiffeners can be placed in the panels near the end of the girders to give additional support to the web. Shelf angles can be strengthened by short vertical stiffeners beneath them. Where web splices with low classification occur, these can be replaced with wider splice plates with additional rows of rivets in the splices.

In through bridges the stringers can be reinforced by additional riveting, by the placing of additional stringers, either timber or steel, and by shifting existing stringers to secure better distribution of the load. Where stringers are spaced so that some stringers do not carry their full proportion of load, it is possible to introduce cross bracing, so that all the stringers in the panel act together to carry the load and relieve excessive load on certain stringers.

Floor beams can be reinforced by cover plates or

angles added to the flanges, by additional riveting, or by shifting the stringers toward the trusses to reduce the bending in the floor beams. In very old bridges floor beams are frequently of much lower classification than the remainder of the bridge and can sometimes be replaced entirely at a reasonable expense to get additional life out of the remainder of the structure.

In trusses, diagonals and counters can usually be reinforced with additional bars of rods with loops over the truss pins and connected by turn buckles to provide adjustment. Similarly, bottom chords of eye-bars can be reinforced with additional bars with yokes bearing on the heads of the original eye-bars.

End posts of through bridges, having low classification due to eccentricity, can be strengthened by placing angles or plates on the sides of the members, so as to reduce the eccentricity.

Where pins have low classification it is sometimes possible to move the members on the pin to reduce the bending. In some cases diaphragms placed inside of built-up numbers will relieve bending on the pin. The pins themselves can be strengthened by replacing with high carbon or special alloy steel pins of the same size, or if additional strength is required, by boring out the pin holes and putting in larger pins.

The cost of strengthening bridges varies with the size of the job, the amount of staging required, the extent that shifting of members is required to reach different portions of the work: the size of the crew available, the distance traveled by crew, the tools available, etc. In a general way, it has been found that the cutting out and replacing of rivets on ordinary strengthening jobs costs from 25 to 75 cents each. Drilling and driving new rivets, $0.50 to $1 each; that is, the cost of such work will be given by the total number of rivets driven at these unit prices, plus the cost of additional material required.

With the maintenance of old and light capacity bridges, the question continually arises whether it is more economical to strengthen the structure or renew it. As a general proposition it would be permissible to spend each year for strengthening an amount equal to the interest on the investment in a new bridge, less the cost of additional maintenance required by the old bridge on account of the greater attention it receives.

It must be recognized, of course, that a newly designed and heavy structure is preferable to a lighter structure. It is possibly true that in case of a serious accident on a bridge, a light structure might be destroyed while a heavy new structure might withstand the same treatment without being seriously disabled. Such consideration must be taken into account in shaping the general policy in keeping light bridges in service.

DISCUSSION

In the discussion of this paper attention was called to the statement made by Mr. Morse on the day previous to the effect that a road is now justified in making much larger expenditures to carry a bridge over for a year or two than in normal times owing to the greatly increased cost of rebuilding it under present conditions and to the necessity of conserving labor and materials. The consensus of opinion as expressed in the discussion was that the roads should make much more extensive repairs than normally and that the complete renewal of a structure should be resorted only to special cases.

L. D. Hadwen (C. M. & St. P.) referred to the necessity of giving more careful consideration to the recommendations made by bridge inspectors for the rewenal of structures, as these inspectors very properly take no chances and are inclined to be liberal in their recommendations for renewal. If the safety of the structure is any way in doubt the matter should be referred to the bridge engineer. J. S. Robinson (C. & N. W.) urged the more frequent inspection of bridges as a necessary step if they are to be carried over, in order that no dangerous condition may be allowed to develop. L. Jutton (C. & N. W.) referred to the large proportion of the repairs to timber structures, which are made by the local division bridge foremen on their own initiative and emphasized the necessity of instructing these foremen regarding the new standards which must now prevail.

A. S. Markley (C. & E. I.) and others referred to the increased fire hazard of old bridges and to the necessity of keeping all decayed timber adzed off to remove a place of lodgment for sparks. R. H. Reid (N. Y. C.) pointed out the fact that decay in certain members does not necessarily weaken the structure, if it is at places where strength is not required, and urged discretion in the condemnation of members on which decay is found. F. E. Schall (L. V.) emphasized the necessity of instructing foremen regarding this point particularly, since closer supervision is now required than in normal times if structures are to be carried over safely and without endangering traffic in any way.

The deterioration of steel structures was also considered. Mr. Robinson described his practice of giving special attention to steel bridges on lines carrying refrigerator traffic. He has found that the frequent cleaning of certain structures and the scraping off of brine corrosion has added materially to their life. In discussing this same subject Mr. Schall stated that structures on curces required particular attention because the surging of the car tends to increase the amount of brine thrown out.

REPORT ON SHIPPING COMPANY MATERIAL ECONOMICALLY

The first thing to be considered is loading properly and to car capacity. In this the user must keep in close touch with his storekeeper. On one road there is run what is known as a supply train over each division monthly, starting this train from the east end of the division and working west. This train has a regular scheduled time to run and all parties in need of supplies must have their orders in at least six days before the train leaves the main division storehouse on its trip. Light supplies are loaded in box cars and heavy supplies in gondolas in order that they can be unloaded by air unloaders. This unloader is double-ended and two cars can be unloaded at same time with a small force of men. This supply train gathers up surplus materials and scrap along the line at the same time and in the same manner as it unloads it. This method is economical and successful.

In shipping material in carload lots it is frequently necessary to load supplies for several different points in order to secure capacity loading. In such instances the material for the points farthest away should be loaded first so that the first stop has its material on top and so on. This applies to one division. Where there is a quantity of light material for various points on different divisions carloads of this kind of material can be handled by loading the cars to a transfer point, where the lading is transferred to cars which can be loaded to capacity for that point direct. This will result in conserving cars.

To insure safety and promptness in handling materials and the quick release of cars there must be harmonious co-operation on the part of all concerned. Also, if the division car service man would send a statement each month to each party on his division responsible for the

prompt release of cars, showing the time cars were received for unloading and the time released and returned and classified in order as to standing in promptness in releasing cars, an incentive would be created that would result in much good to car service. In planning work it may be classified under the following heads: (1) emergency, (2) urgent, (3) routine. By emergency is meant that which demands immediate attention and supersedes all other work. Urgent work is that by which the greatest good to the service can be obtained through the releasing of cars. Routine work is that which follows in its turn accordingly as orders are received.

Let us summarize the leading points considered: (1) Load to car capacity. (2) Load properly to enable cars to be released quickly when several points have material in the same car. (3) Give prompt notification to parties to whom contents are consigned. (4) Provide mechanical air lifts to aid in unloading in order to reduce man power. (5) Create an appreciation of the demand for car service owing to the war. (6) Arrange for the division car service man to keep a record and notify all concerned as to their standing in the prompt release of cars. (7) Impress all concerned of the urgent need of the most hearty and harmonious co-operation.

Z. T. BRANTNER, superintendent maintenance of way shops, B. & O., Martinsburg, W. Va., chairman.

DISCUSSION

The discussion of this paper was directed largely toward the necessity of co-operation between the maintenance of way and the stores department in the handling of material. A. H. King (O. S. L.) and others pointed out different ways in which the two departments can cooperate in increasing carloads and removing such deficiencies in common practices as are found to exist.

REPORT ON LABOR-SAVING DEVICES

It has always been a noticeable fact that the more extensively an industry has adopted labor-saving devices the more rapidly it has developed, and this development has not alone been due to the devices, but it results also from the careful planning and organization of the work. The man in charge of work is the first factor in the problem of saving labor, because much depends upon him. It is his part to plan the work so that each operation can be accomplished to the best advantage.

The heavier work of the bridge and building department is usually quite well provided for, because every railroad has as a part of its equipment pile drivers, locomotive cranes, derricks, and other machinery for doing heavy work. Such equipment is provided as a matter of course. The conditions prevailing during the last few years have brought about an unusual interest in the smaller machines and tools that permit the depleted forces to keep up their maintenance and construction work. No argument is now needed as to the value of such devices, but the question is rather—what can be had and how can it be applied?

The motor car for the transportation of men and material is accomplishing great results. Through its use men are carried to their work with the least expenditure of time and arrive at the job physically ready to go to work. It enables crews to go longer distances from their outfits, and because of this, outfits have to be moved less frequently, thereby saving train service. The push car loaded with material and hauled as a trailer is handled much more expeditiously than in the old manner.

The concrete mixer is another device which has brought about much saving of labor and is now manufactured in so many different forms that all classes of work can be taken care of. The smaller portable outfits are economical for use on comparatively small pieces of work and the larger outfits, in conjunction with hoists, conveyor belts and other devices, are proving effective on large construction work.

The gasoline engine is another device that has affected much saving in labor. It is used in conjunction with the motor cars and concrete mixers before mentioned, and, in its various forms, can be adapted to many operations on maintenance work, such as running pumping machinery, hoists, etc. The manufacturers have placed on the market a variety of tool grinders, with numerous attachments, that make them almost an indispensable part of the working outfit and their high value is self-evident.

Hand derricks or cranes can be used effectively for lifting and placing heavy timbers and other heavy material and have proven very effective when mounted on push cars. The Northern Pacific has in use a home-made hoist mounted on a push car which is very simple of construction and easily manipulated. The Southern Pacific has a light steel derrick mounted on a push car which is used for similar work.* The Chicago, Milwaukee & St. Paul has similar home-made devices installed on push cars, which will enable two or three men to accomplish work that formerly required six or eight.

F. E. WEISE, chief clerk to chief engineer, C. M. & St. P., Chicago, chairman.

REPORT ON SMALL VS. LARGE GANGS FOR MAINTENANCE WORK

This subject admits of a wide variation of ideas and is one on which much can be said for and against either small or large gangs. The success of either rests with the foreman and his ability to lay out the work and arrange the details so that neither confusion nor discord are permitted to arise.

A close observation and study of men in charge of gangs discloses three classes, (1) a man who can handle two or three men to good advantage and keep them busy, but whose efficiency as a foreman ceases when he gets more than this number; (2) the man who is capable of handling a large crew of men on a large job, but who is at sea on a small one, and (3) the man who is the happy medium between the first and second types and has the foresight and ability to lay out and arrange his work so that he can keep all his men busy, whether the job is small or large. It is the belief of the chairman that for general maintenance work a crew composed of a foreman and from five to seven men is preferable to a larger one and the work is done more efficiently and economically. Take the gang stationed at the average terminal, where perhaps the men may all work at the same job from one to several days at a time, or they may be spread out for days at a time so that not more than two men will be working together. Then it is that the foreman has his hands full to look after them and see that the work is done properly and that the men do not lack for material. Here is where the small gang is preferable to the larger one, as it gives the foreman more time to oversee the work. At the present time we all realize that the closer the supervision the better will be the results obtained.

A road gang should have about the same number of men as one in a terminal. Take, for example, a job of renewing bridge ties or cutting off piles and putting on frame bents. A gang of from six to seven men can work to good advantage without getting in one another's way and can accomplish practically as much as a larger crew

*Both of these devices were described in the *Railway Maintenance Engineer* for January, 1918, pages 12 and 13.

on the average job of this kind, especially where the traffic is at all heavy.

The framing can be done while waiting for trains and timbers can be put in after the trains have passed, where if too many men are working the framing can be done faster than the timbers can be used, making it necessary for the men to be idle a part of the time.

On building work we have many jobs on which it is very difficult to keep even six or seven men employed to good advantage. Then, again, small emergency jobs turn up at a point distant from the location of the gang that require the service of from one to three men. While this work is in progress there are usually minor repairs at other points to be taken care of that the foreman can have done by other members of the crew, so that the whole gang can be working to advantage. I believe that the average foreman plans his work when he goes to a job and organizes his forces accordingly. If a large gang is employed when these small and emergency jobs come up and he has to send away a part of the gang it disorganizes the entire force.

J. P. WOOD, supervisor bridges and buildings, Pere Marquette, Saginaw, Mich., chairman.

DISCUSSION

R. H. Reid (N. Y. C.) called attention to the fact that for larger work such as bridge erection, adequate progress cannot me made with a small gang, and that it is impossible for a small number of men to handle the large members. C. A. Lichty (C. & N. W.) called attention to the need of an adequate force on emergency work, since this must be done in the shortest possible time, although under ordinary circumstances, where time is of no particular concern, a small gang can usually do the work with greater economy.

One point brought up which must be considered in determining the relative economy of large and small gangs is the fact that the overhead expense is larger with a small gang. For instance, where cooks are supplied the expense of the cook is distributed over a smaller number of men where the gang is small.

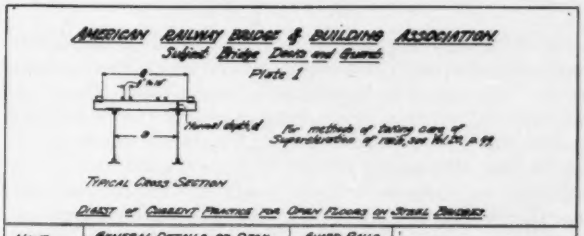
W. E. Alexander (B. & A.) favored a gang of six or eight men for ordinary work. Where the job requires a smaller number than this he favored sending the men to the work temporarily from the headquarters of the larger organizations. The question of keeping the men over the winter introduces another problem, since only certain classes of work can be done during this season to advantage. In reply to this, Mr. Reid said that plans for winter work must be made early in the season so that there will be enough of this in view to keep the men busy.

REPORT ON BRIDGE DECKS AND GUARDS

The committee received replies from 25 railroads in response to a circular letter sent out soliciting prints of standard practice with reference to bridge decks, ties and their spacing, inner and outer guard rails, etc. All but 7 responded to the inquiry for information wanted, although some of the roads sent only partial data as to bridge decks. The committee was impressed with the practical agreement as to the use of T-rails for inner guards. Generally second hand and scrap rails removed from running tracks or from stock are used. An old frog point, or a point casting is used where facing the traffic and in a few cases also where trailing the traffic. Points are of course used at each end of a single track bridge, the distance from bridge ends varying from 30 ft. to 90 ft. The distance between the heads of running rails and guard rails is found to vary between 8 and 10 in. However, 8 in. and 9 in. spacings predominate. It is not clear in some cases whether the inner guard rail is spiked to every tie or every other tie.

Referring to the subject of the open floors in steel bridges, the general practice seems to be to bolt every second or third tie to steel stringers or girders. Outer guard rails are generally bolted to every third or fourth tie by means of machine bolts or lag screws. Inner guard rails are usually spiked to every second tie, and in a number of cases to every tie.

Most of the replies received did not indicate whether tie plates were used under running rails on ties on bridges.


AMERICAN RAILWAY BRIDGE & BUILDING ASSOCIATION
Subject: Bridge Decks and Guards
Plate 1
Normal depth of
for methods of taking care of Superelevation of rails, see Vol. XX, p. 99
TYPICAL CROSS SECTION

DIGEST OF CURRENT PRACTICE FOR OPEN FLOORS ON STEEL BRIDGES

NAME OF RAILROAD	GENERAL DETAILS OF DECK						GUARD RAILS		REMARKS
	SIZE OF TIE	c. to c.	c. to c.	c. to c.	Spacing of Ties	Tie Plates Used	INNER, KIND	OUTER, SIZE	
A.T. & S.F.	8"x8"-12'	7½	7-0	7-7	12	Some	T-rail	6"x8"	Some sites for several types of bridges
B. & O.	9"x8"-9'	7½	6'-8" to 9'-3"		14		T-rail	6"x8"	Main rail spaced every other tie, except on curves spaced every tie.
B.R.&P.	8"x12"-12'	11½	8'-0	8'-9	14	Each for main Line	T-rail	6"x8"	8'-6" Ties used for spans less than 75'
"	8"x10"-10'	9½	7'-0	8'-8	14		T-rail	6"x8"	See above.
C. & O.	8"x10"-10'	9½	6'-6	8'-0	12		T-rail	7"x8"	Inner gd rail on all bridges.
"	8"x12"-11'	11½	8'-0	9'-0	12		T-rail	7"x8"	"
C.&N.W.	8"x8"-12'	8	5'-6	10'-4	12	Generally on Curves		10"x12"	* Bolted every tie.
"	8"x10"-12'	10	8'-0	10'-4	12	"		10"x12"	" " "
C.B.&Q.	9"x10"-10'	10	7'-0				T-rail	6"x8"	
"	8"x12"-10'	12	9'-0				T-rail	6"x8"	
C.M.&St.P.	8"x12"-10'	11½	7'-6	10'-	12		4"x6" T-rail & Bolt L.	5"x8"	Spacing blocks used between ties.
"	8"x12"-12'	11½	8'-0	-	12		4"x6" T-rail & Bolt L.	5"x8"	"
C.R.I.&P.	8"x10"-10'	9½	7'-0	8'-7	12		T-rail	6"x8"	Main rails laid spiking over entire bridge.
"	8"x12"-12'	11½	8'-0	10'-0	12		T-rail	6"x8"	"
ERIE	8"x8"-9'	7½	5'-0	7'-5	14			5"x8"	Mach. bolts every 5th tie in outer G.R.
"	8"x12"-10'	11½	8'-0	7'-6	14			5"x8"	Lag screws " " " " "
FLORIDA CENT.	8"x10"-10'		7'-5	7'-0	16		T-rail	6"x8"	"
"	10"x10"-11'		7'-9	7'-0	16		T-rail	6"x8"	Outer tie spacing blocks used.
GR. TRUNK	10"x10"-13'	9½	7'-0	11'-5	14		T-rail	8"x8"	Six threads Long. Bolt if ties are used
GT. NORTHERN	8"x12"-12'	11½	7'-6	10'-0	12	Each for main Line	T-rail	6"x8"	Ties gd rails, and rail spiked every other tie on tangent, except at diamonds ordered.
ILL. CENTRAL	8"x8"-10'	8	7'-0	7'-5	14		T-rail	6"x8"	
"	8"x10"-12'	10	8'-0	8'-4	14		T-rail	6"x8"	
L.&N.	8"x8"-10'	8	6'-6	6'-0	14		4"x7" Timber	5"x8"	Rail fastened with lag screws at 7'-6" ties used. Tie plates on curves.
"	8"x11"-13'	10½	9'-0	6'-0	14		6"x7" Timber	6"x9"	"
MICH. CENT.	8"x10"-12'	7	5'-6	10'-0				6"x8"	Ties laid flat. Data from special plan.
N.Y. CENT.	8"x10"-11'	9½	6'-6	9'-8	12		T-rail	5"x8"	
"	8"x12"-11'	-	8'-0	9'-8	12		T-rail	6"x8"	
N.Y.N.H.&H.	8"x8"-11'	7½	5'-6	7'-0	14		T-rail	6"x8" Timber 6"x8" L.	
"	8"x12"-11'	11½	8'-0	7'-0	14		T-rail	6"x8" Timber 6"x8" L.	
PENN. LINES W.	8"x8"-9'		6'-6	7'-0"	14		T-rail	6"x8"	Inner gd rail bonnet every 5th tie.
PENNSYLVANIA	10"x9"-9'	9	6'-6	9'-0"	16	Each tie	T-rail	6"x8"	10"x10"-11' Ties used where 3-5/8"
Union Pacific	8"x10"-12'	9½	7'-0	7'-0	12	" "	T-rail	5"x8"	
"	8"x12"-12'	11½	8'-0	7'-0	12	" "	T-rail	5"x8"	Also larger ties for wider ballast spacing
W.&L.E.	8"x12"-10'	11½	7'-6	Var.	14		T-rail	6"x8"	

Note: 21 Railroads use no tie spacing blocks, but one outer G.R. than 7 ties. 3 Companies use tie spacing blocks.

We assume that railroads using tie plates under rails on ordinary ballasted tracks on roadway would likewise use them on bridges. One company reports the use of tie plates also under the inner guard rail.

It is suggested that railroads working up new standards of practice should be governed by the following principles, so far as steel spans are concerned: A constant distance should be maintained from center to center of stringers, and of girders up to a considerable span length; no change in size of tie will then be found necessary. The width of deck and the distance "in to in" of outer guard rails may thus be kept uniform, which will give a good appearance, and also reduce the number of sizes of sheets of galvanized iron required to be held in stock, where it is the practice to fireproof decks with sheet iron.

H. A. GERST, assistant engineer, bridge department, Great Northern, St. Paul, chairman.

DISCUSSION

This report gave rise to considerable discussion, particularly with reference to the anchoring of rails on bridges, the general agreement being that it was not good practice to slot spike joints on structures. There was also considerable discussion regarding the character of inside guard rails which should be installed, W. E. Alexander (Bangor & Aroostook) opposing the placing of these points at the ends of these guard rails because of the possibility of its throwing a derail truck to the wrong side and adding to the damage. Other members disagreed with this position.

OTHER FEATURES

W. H. Finley, president of the Chicago & North Western, spoke before the convention on Wednesday afternoon. His talk was largely of a reminiscent character, in which he made a comparison between the conditions under which men worked 20 years ago and those existing to-day. He paid a tribute to the work which this association has done in bringing together the practical and the theoretical knowledge of bridge construction and maintenance, stating that this organization has done more to harmonize these viewpoints than any other.

George F. Porter, engineer of construction of the St. Lawrence Bridge Company, Montreal, described the erec-

GROUP OF VISITORS AT THE CEMENT MILL

tion of the Quebec bridge on Tuesday evening. His talk was illustrated with slides and moving pictures, showing the various steps in the construction of this spectacular structure.

On Wednesday evening the annual association dinner was held at the Sherman Hotel. It was followed by a description of flood control work on the lower Mississippi river by John Melton, official photographer of the Illinois Central, the lecture being illustrated by moving pictures of the rescue of refugees and of the construction of levees.

On Thursday forenoon a small party visited the plant of the Universal Portland Cement Company at Buffington, Ind., where they were shown the manufacture of cement.

R. H. AISHTON SPEAKS

R. H. Aishton, regional director of the Northwestern region, United States Railroad Administration, was present at the session on Wednesday morning and spoke on the work which the men in the bridge and building department could do to facilitate the winning of the war. He paid a tribute to the loyal support which the men in this branch of railway service have always given the roads. Having served in this branch of the maintenance of way department for a number of years he has watched with close interest the problems now confronting the men, whereby they are now required to do more work than ever before, while they have fewer men and less material to do this work with. He laid special stress upon the necessity of conserving equipment in the handling of company material, since every car retained in this service unnecessarily is depriving our military forces of the supplies which that car could otherwise carry.

ELECTION OF OFFICERS

The annual election of officers was held late Wednesday afternoon, at which time the following selection was made for next year: President, L. Jutton, division engineer, C. & N. W., Chicago; first vice-president, F. E. Weise, chief clerk to chief engineer, C. M. & St. P., Chicago; second vice-president, W. F. Strouse, assistant engineer, B. & O., Baltimore, Md.; third vice-president, C. R. Knowles, superintendent water service, Illinois Central, Chicago; fourth vice-president, Arthur Ridgeway, assistant chief engineer, D. & R. G., Denver, Colo.; secretary-treasurer, C. A. Lichty, purchasing department, C. & N. W., Chicago; members executive committee, E. T. Howson, editor, *Railway Maintenance Engineer*, Chicago; C. W. Wright, master carpenter, L. I., Jamaica, N. Y.

Cleveland, Ohio, was selected as the location for the next convention.

THE SUPPLY EXHIBIT

The Bridge and Building Supply Men's Association presented an exhibit of devices used in the bridge, building and water service fields in a room adjoining the convention hall, the exhibits consisting principally of models, samples and literature covering these products and devices.

The officers who were in charge of this Association for the past year were as follows: President, L. D. Mitchell, Detroit Graphite Co., Chicago; vice-president, P. C. Jacobs, H. W. Johns-Manville Co., Chicago; treasurer, Tom Lehon, The Lehon Company Chicago; secretary, C. E. Ward, U. S. Wind Engine & Pump Co., Batavia, Ill.; executive committee, W. H. Pratt, Heath & Milligan Mfg. Co., Chicago; M. J. Trees, Chicago Bridge & Iron Works, Chicago; C. F. Massey, C. F. Massey Co., Chicago; C. L. Cockrell, Philip Carey Co., Cincinnati, O.; E. T. Howson, *Railway Maintenance Engineer*, Chicago, and E. J. Caldwell, the Barrett Co., New York.

The following is a list of companies exhibiting and their representatives:

American Hoist & Derrick Co., St. Paul, Minn., represented by F. J. Johnson and W. O. Washburn.

American Valve & Meter Co., Cincinnati, Ohio, represented by J. T. McGarry and Dan J. Higgins.

American Tar Products Co., Chicago, represented by P. L. Griffiths, F. H. Fields and F. E. Walter.

Barrett Company, The, New York, represented by G. R. McVay, A. J. Ross, F. W. Freeman and K. C. Barth.

Bird & Son, Inc., East Walpole, Mass., represented by M. L. Caton and H. A. Inwood.

Carey Co., Philip, Cincinnati, Ohio, represented by C. L. Cockerell and F. L. Scheuler.

Chicago Bridge & Iron Works, Chicago, represented by M. J. Trees, H. C. Brown, C. M. Ladd and C. H. Scheman.

Chicago Pneumatic Tool Co., Chicago, represented by Ed. Aplin and F. F. De Garmo.

Detroit Graphite Co., Detroit, Mich., represented by J. J. Hogan, L. D. Mitchell and W. D. Waugh.

Dickinson Co., Paul, Chicago, represented by A. J. Filkins.

Dixon Crucible Co., Joseph, Jersey City, N. J., represented by H. A. Nealley, J. E. Simpson and Neal Cameron.

Duff Manufacturing Co., The, Chicago, represented by C. N. Thulin and E. A. Johnson.

Fairbanks, Morse & Co., Chicago, represented by E. C. Golladay, F. M. Condit, L. H. Mathews, A. A. Taylor and C. D. Skelton.

International Filter Co., Chicago, represented by M. P. Robinson.

Kelly-Derby Co., Chicago, represented by C. W. Kelly, W. B. Holcomb and O. K. Fisher. Special representative of Kaustine Co., G. W. Hambrook.

Johns Manville Co., H. W., Chicago, represented by P. C. Jacobs, D. L. Jennings, W. H. Lawrence, C. E. Murphy, W. D. Otter, J. H. Trent, E. H. Willard and J. C. Younglove.

Lehon Co., The, Chicago, represented by Tom Lehon and D. B. Wright.

Massey Co., C. F., Chicago, represented by C. F. Massey, Paul Kircher, R. G. Fliel, J. E. Moody and E. C. Alexander.

Mudge & Company, Chicago, represented by Burton W. Mudge and Herbert Deeming.

Nichols & Bro., Geo. P., Chicago, represented by Geo. P. Nichols.

Patent Vulcanite Roofing Co., Chicago, represented by A. J. Van Page and J. P. Woolsey.

Q. & C. Company, The, New York, represented by B. L. Barber and J. V. Wescott.

Railway Maintenance Engineer, Chicago, represented by L. B. Sherman, E. T. Howson, H. H. Simmons and W. S. Lacher.

Railway Review, Chicago, represented by Willard A. Smith, Harold A. Smith, Chas. L. Bates and L. H. Lozier.

Snow Construction Co., T. W., Chicago, represented by T. W. Snow and R. E. Curley.

Standard Asphalt & Refining Co., Chicago, represented by R. H. Trimble.

Texas Company, The, Houston, Texas, represented by J. J. Flinn, W. L. Gibbs and F. E. Sheehan.

U. S. Graphite Co., Saginaw, Mich., represented by James G. Draught and H. E. Borland.

Volkhardt Company, Inc., New York and Chicago, represented by Wm. Volkhardt, Chas. Cogswell and Willis Squires.

The De Vilbiss Mfg. Co., Toledo, Ohio, represented by W. F. Gradolph and C. D. Ward.

The annual meeting was held Thursday morning. The treasurer's report showed the Association in good financial standing and on motion it was decided to invest $800 in liberty bonds. The election of officers for the ensuing year resulted in the choice of the following: President, P. C. Jacobs, H. W. Johns-Manville Company; vice-president, Tom Lehon, The Lehon Company; treasurer, C. E. Ward, United States Wind Engine & Pump Company; secretary, M. J. Trees, Chicago Bridge & Iron Works; new members executive committee, C. R. McVay, the Barrett Company, to succeed E. J. Caldwell, resigned, and W. O. Washburne, American Hoist & Derrick Company, and A. J. Filkins, the Paul Dickinson Company, for term ending 1921.

THE MATERIAL MARKET

THE SUCCESS of the allied armies in France, while naturally suggesting an early conclusion of peace, have actually increased the demands for materials of all kinds. One of the most immediate effects has been the demand for track materials since the great advances into territory given up by the enemy necessitates an enormous expansion of the military railway system as well as the restoration of the various French railways as they are being released by the eastward movement of the war front. For this reason, American rail mills are now at work on 200,000 tons of rails for General Pershing and will soon commence rolling 135,000 tons for the French government. These emergency orders, together with those for American railways still on the books of the manufacturers, have led to an increase in the production of rails in recent weeks. However, the production is still insufficient to satisfy the demands, as indicated by the fact that one of the leading manufacturers has rail orders that will take a year to complete at the present rate of rolling.

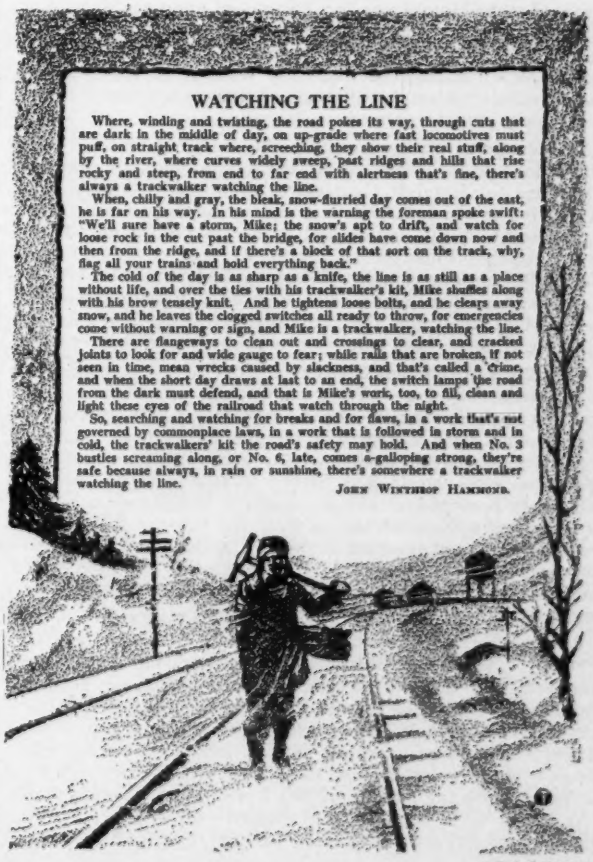
On October 1, a number of increases in prices of iron and steel products were put into effect according to schedules announced by the Iron and Steel Institute. These include an advance in the price of cut nails from $4 per 100 lb. to $5; and an increase of $5 per ton on cast iron water pipe, so that the price f. o. b. cars for 6-in. pipe and larger is $60 at Birmingham, $67.70 at New York and $66.80 at Chicago.

A new schedule of warehouse prices has also been introduced which includes the following differentials per 100 lb., which represents the maximum amount which may be added to the manufacturer's price plus freight from Pittsburgh to the warehouse point:

Structural shapes	$1.00
Plates	1.00
Track Spikes	1.00
Track Bolts	1.00
Boat Spikes	1.00
Barbed Wire	1.00
Cut Nails	0.50
Wire Nails	0.50

Effective October 17, a new schedule of differentials was promulgated covering iron bars, this being of interest to the maintenance of way man because it is the material from which water tank hoops are commonly made. The base price per 100 lb. of common merchant iron is $3.50, the base price per 100 lb. for refined iron is $5; the differentials for various sizes of these bars in the new list are substantially one-half of what they were.

No changes in the prices of lumber or in marketing conditions of this material have been noted recently. The production of Portland cement is now subjected to the restriction of the fuel administration in that the consumption of coal during the calendar year of 1918 must be only 75 per cent of the average annual consumption of 1915 to 1917, inclusive. However, with great reductions in the building and road programs and considerable delay in carrying out the Emergency Fleet Corporation's program for concrete ships, the prospects of an inadequate supply would seem to be rather remote.



WATCHING THE LINE

Where, winding and twisting, the road pokes its way, through cuts that are dark in the middle of day, on up-grade where fast locomotives must puff, on straight track where, screeching, they show their real stuff, along by the river, where curves widely sweep, past ridges and hills that rise rocky and steep, from end to far end with alertness that's fine, there's always a trackwalker watching the line.

When, chilly and gray, the bleak, snow-flurried day comes out of the east, he is far on his way. In his mind is the warning the foreman spoke swift: "We'll sure have a storm, Mike; the snow's apt to drift, and watch for loose rock in the cut past the bridge, for slides have come down now and then from the ridge, and if there's a block of that sort on the track, why, flag all your trains and hold everything back."

The cold of the day is as sharp as a knife, the line is as still as a place without life, and over the ties with his trackwalker's kit, Mike shuffles along with his brow tensely knit. And he tightens loose bolts, and he clears away snow, and he leaves the clogged switches all ready to throw, for emergencies come without warning or sign, and Mike is a trackwalker, watching the line.

There are flangeways to clean out and crossings to clear, and cracked joints to look for and wide gauge to fear; while rails that are broken, if not seen in time, mean wrecks caused by slackness, and that's called a crime, and when the short day draws at last to an end, the switch lamps the road from the dark must defend, and that is Mike's work, too, to fill, clean and light these eyes of the railroad that watch through the night.

So, searching and watching for breaks and for flaws, in a work that's not governed by commonplace laws, in a work that is followed in storm and in cold, the trackwalkers' kit the road's safety may hold. And when No. 3 bustles screaming along, or No. 6, late, comes a-galloping strong, they're safe because always, in rain or sunshine, there's somewhere a trackwalker watching the line.

JOHN WINTHROP HAMMOND.

—B. R. & P. Magazine

GENERAL NEWS DEPARTMENT

The railroads of the United States handled 713,076 more cars of coal in 1918 up to and including the week ending October 12 than in the same period for last year.

Baltimore & Ohio and Pere Marquette passenger trains entering Chicago are now routed over the Pennsylvania from Pine Junction, Ind. This change saves seven miles in distance.

A heavy movement of freight is recorded by the Pennsylvania Railroad for the month of September, when an average of 6,835 cars a day were moved over its main line between Pittsburgh and Harrisburg.

Hon. George W. Anderson of Massachusetts, who has been a member of the Interstate Commerce Commission for about one year, has been nominated by President Wilson for appointment as United States circuit judge for the first circuit.

The Liberty Loan subscriptions from employees of railroads under federal control totaled $164,992,150, according to a statement issued by the United States Railroad Administration on October 22, based upon incomplete returns. These subscriptions were made by 1,642,694 employees and did not include subscriptions made by railroad corporations.

Effective November 1, 1918, the sleeping and parlor car rates and the additional passage charge for the occupancy of space in such cars will be combined in one ticket. As rapidly as the necessary alterations in ticket offices can be made the sleeping car and railroad ticket selling forces will also be combined, so that a passenger can purchase both kinds of transportation from the same ticket clerk in one transaction.

The fifteenth annual convention of the Maintenance of Way Master Painters' Association of the United States and Canada was held at the Hotel La Salle, Chicago, on October 15, 16 and 17, with a registration of 33 members out of a total membership of 75. A large part of the program was devoted to the discussion of matters of particular interest to the maintenance painter under prevailing conditions. A report of the proceedings will be given in next issue.

The Virginian Railway has recently received ten 2-10-10-2 Mallet locomotives from the American Locomotive Company which are the heaviest locomotives ever built. They weigh 684,000 lb., of which 617,000 lb. is carried on the drivers. The total weight of the engine and tender is 898,300 lb. They have a tractive effort of 147,200 lb. working compound and 176,600 lb. working simple. These engines will be operated in pairs in pusher service with a 2-8-8-2 Mallet engine at the head of the train, the three locomotives being able to handle a train of 5,850 tons over a grade of 2.07 per cent.

The Tie and Timber Division of the St. Louis Chamber of Commerce held a meeting on October 4, at which preliminary steps were taken in the organization of a national association of firms engaged in the manufacture of railroad cross ties to provide a channel for communication and cooperation with the United States Railroad Administration and other branches of the government in matters relating to the manufacture and sale of ties. At this meeting it was decided to call a convention of the men in this industry, which will be held at St. Louis, Mo., on November 19 and 20, the invitations to this meeting being limited to those contractors engaged in the manufacture of cross ties.

At a conference between a number of tie producers and L. S. Carroll and F. A. Bushnell of the regional purchasing committee for the Northwestern region, which was held in Chicago recently, the question of the disposition of ties which do not comply with present specifications, but which formerly had been accepted by the individual roads, was considered. For instance, it was stated that the new specifications require the making of ties from timber not less than 9 in. to 9½ in. in diameter at the small end, whereas, before the new specifications were made effective, ties were accepted that had been made from timber as small as 8 and 8½ in. at the small end. The regional purchasing agents advised that the individual buyers of the various roads have authority to purchase these rejected ties at a price considerably in advance of that for culls, which is 34 cents, but not within 10 cents of the lowest price authorized for ties complying with the specifications. In fact, it was stated that the price to be paid is a matter for negotiation between the individual roads and the tie producers.

RAILWAY EARNINGS IN 1917

Railway statistics of class 1 roads for the calendar year 1917 are contained in bulletin No. 128 of the Bureau of Railway Economics, which gives a summary of the principal roads in this class. The figures are preliminary and in some cases are liable to correction. An average operated mileage of 232,699 miles of line is represented in the statistics. The income account with comparisons for the previous year is as follows:

United States	Year ending 1917	December 31, 1916	Increase in 1917 over 1916
Railway operating revenues	$4,012,968,828	$3,593,605,875	$419,362,953
Railway operating expenses	2,828,179,885	2,356,133,528	472,046,357
Net operating revenue	1,184,788,942	1,237,472,347	*52,683,404
Net operating income	943,734,286	1,040,610,712	*96,876,426
Non-operating income	216,803,729	203,730,643	13,073,086
Gross icome	1,160,538,015	1,244,341,355	*83,803,340

*Decrease.

The average number of general and division officers during the year was 18,465 and their total compensation was $57,224,997. The total number of employees, excluding officers, was 1,714,238 and their total compensation was $1,681,571,049, an average of $980.94.

ENGINEERING MATERIAL SHIPPED ABROAD

The following table of materials shipped from this country up to August 31 by the corps of engineers for the use of our armies abroad, which includes some of the materials used largely by the military railway department, has been given out by the acting secretary of war, Benedict Crowell:

Rails and accessories—standard gage track	213,000 tons
Rails and accessories—narrow gage track	64,000 tons
Structural steel	45,000 tons
Corrugated iron	7,000 tons
Barbed wire	16,000 tons
Lumber, including ties, stringers and piles	57,000 tons
Building materials:	
Wall board	2,000 tons
Expanded metal	5,000 tons
Nails	10,000 tons
Camouflage materials:	
Wire netting	2,000,000 sq. yd.
Paint	1,200 tons
Burlap	3,000,000 sq. yd.
Fish netting	1,300,000 sq. yd.
Steel warehouse sheds, 100, covering	2,000,000 sq. ft.

Pontoon equipment—Pontoon equipment for 3 divisions has been shipped overseas, and the equipment for 36 additional divisions is now being freighted.

In addition, large quantities of engineering materials have been purchased in England, France and Switzerland, including 8,015 tons of machinery, 5,117 tons of materials for locomotives and cars, and 114,628 tons of materials for track and ties.

PERSONAL MENTION

CORPORATE

C. L. Wallace, assistant to the receiver of the Texas & Pacific, who was for several years an engineer in railway work, and recently valuation engineer of the Kansas City Southern, has been elected vice-president of the Texas & Pacific, with headquarters at New Orleans, La.

Richard Montford, who has been appointed chief engineer of the Louisville & Nashville for the corporation, with headquarters at Louisville, Ky., was born on March 4, 1854, in Ireland. He was educated at the Royal College of Science for Ireland and graduated as a civil engineer in 1876. He began railway work on July 1, 1880, with the Louisville & Nashville, and for three years served as bridge engineer. From 1883 to 1887 he was resident engineer in charge of roadway, bridges and buildings, and then was chief engineer until 1905, when he became consulting engineer of the same road, which position he held until his recent appointment as chief engineer for the corporation, as above noted.

Charles S. Churchill, assistant to the president of the Norfolk & Western, with headquarters at Roanoke, Va., has been appointed vice-president, with the same headquarters. Mr. Churchill was born on September 22, 1856, at New Britain, Conn., and graduated from Sheffield Scientific School at Yale University. He began railway work in 1879, and for one year was engaged on surveying projected railroads in Connecticut. From 1880 to 1881, he was engaged on the construction of the Meadville & Linesville, and then for three years was division engineer on location and construction for the Pittsburgh, McKeesport & Youghiogheny, now a part of the Pittsburgh & Lake Erie. On January 1, 1884, he became principal assistant engineer on the construction of the Schuylkill Valley division of the Pennsylvania Railroad, and from May, 1887, for one year was engineer maintenance of way on the Shenandoah Valley, now a part of the Norfolk & Western. From May to October, 1888, he was engineer in charge of the Ohio extension of the Norfolk & Western, and from then to January, 1903, was engineer maintenance of way of this road. On January 1, 1903, he was promoted to chief engineer; on May 1, 1913, was made chairman of the valuation committee, and in February, 1914, was appointed assistant to the president in charge of federal valuation. In June, 1918, he was appointed chief of valuation by the federal manager, with office at Roanoke, which position he held when appointed vice-president of the corporate organization of the Norfolk & Western, as noted above.

CHARLES S. CHUCHILL

Anton Anderson, principal assistant engineer on the Chicago, Indianapolis & Louisville, with headquarters at Chicago, has been appointed corporate engineer with the same headquarters. Mr. Anderson was born at La Fayette, Ind., on October 12, 1879, and attended Purdue University. In 1901 he worked in a structural steel shop in St. Louis, Mo., and the next year entered railway service with the Choctaw, Oklahoma & Gulf as a draftsman in the office and field. In January, 1903, he went with the Indianapolis Northern Traction Company as office engineer and masonry engineer. In January of the next year he went with the Midland Valley on location work and in August of that year became city engineer at La Fayette, Ind., which position he held until 1906. In March of that year he was made resident engineer on the Chicago, Indianapolis & Louisville and served in turn as resident engineer, engineer of construction, assistant engineer, division engineer and principal assistant engineer, until August, 1918, when he was appointed corporate engineer, as noted above.

H. C. Booz, who was appointed corporate chief engineer of the Pennsylvania Railroad, as announced in the *Railway Maintenance Engineer* for September, page 314, was a colonel of engineers in the United States Army and saw service in France from October, 1917, until his recent appointment. This fact was not brought out in the sketch above mentioned. After W. W. Atterbury, vice-president of the Pennsylvania Railroad, went to France in the summer of 1917, as director general of transportation of the American expeditionary forces, he asked that Mr. Booz, then assistant chief engineer, be sent to become one of the principal members of his staff. Mr. Booz was granted a leave of absence from the railroad and joined General Atterbury early in October, when he was appointed engineer of construction in charge of buildings and railroad facilities. He was first commissioned a major and later advanced to colonel. The directors of the Pennsylvania Railroad requested the release of Col. Booz, because of his intimate acquaintance with the engineering affairs of the road, Chief Engineer A. C. Shand and Assistant Chief Engineer E. B. Temple having been taken over by the United States Railroad Administration.

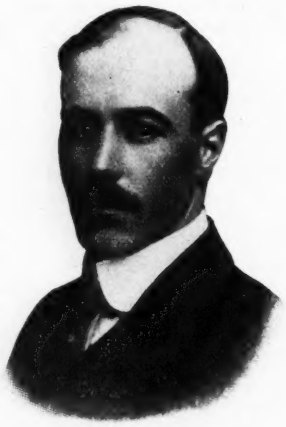
H. C. Booz

J. R. Leighty, engineer maintenance of way of the Missouri Pacific at Kansas City, Mo., has been appointed corporate chief engineer of the Missouri Pacific. He was born at Spencerville, Ind., on September 16, 1870, and graduated from Rose Polytechnic Institute in 1891. He then entered the service of the Wisconsin Central, now a part of the Minneapolis, St. Paul & Sault St. Marie, as a freight bill clerk. A few months later he went with the Chicago & North Western as a rodman, and subsequently became instrument man and assistant engineer. As assistant engineer, Mr. Leighty had charge of construction work in the Wood street (Chicago) yard and of the track work in connection with track elevation on the Rockwell street branch to Forty-third street, Chicago. Later he became roadmaster at Sparta, Wis., and at Carroll, Iowa. In 1889, he went to the Union Pacific and was assigned to duties in connection with track reconstruction and ballasting work in Wyoming. The following year he entered the service of the Baltimore & Ohio, as an assistant engineer in division engineer's office at Newark, Ohio.

J. R. LEIGHTY

Later he served in the same capacity at Winchester, Va., Parkersburg, W. Va., and Cumberland, Md. In 1907 he was appointed engineer maintenance of way on the Western District of the Missouri Pacific, with office at Kansas City, Mo., which position he held until his appointment as chief engineer of the corporation, as mentioned above.

George W. Hand, valuation engineer of the Chicago & North Western and the Chicago, St. Paul, Minneapolis & Omaha, with headquarters at Chicago, has been appointed corporate engineer of those companies, with the same headquarters, effective November 1. Mr. Hand was born at Huntertown, Ind., in 1882, and was educated at Purdue University. In March, 1903, he entered railway service with the Chicago & North Western as a tapeman and has been with that line ever since. During his first four years of railroad experience he was employed as tapeman, rodman, and instrumentman on location, and construction work and surveys. From 1907 to 1910 he was assistant engineer on track elevation work, following which he was transferred to the chief engineer's office and assigned to special duties, which included making specific investigations, studying standards and carrying on state valuation work. When the federal valuation law was passed he was assigned exclusively to valuation work and was subsequently appointed valuation engineer and a member of the valuation committee of the Chicago & North Western and valuation engineer of the Chicago, St. Paul, Minneapolis & Omaha. He has continued in these capacities up to the time of his recent appointment as corporate engineer of both companies.



GEORGE W. HAND

Daniel Joseph Brumley, valuation engineer of the Illinois Central, with headquarters at Chicago, has been appointed chief engineer to look after the interests of the corporation, with headquarters at Chicago. Mr. Brumley was born near Belmore, Ohio, on March 19, 1865. He was educated at the Ohio University, graduating in civil engineering in 1895. In June of that year he began railway work as assistant section foreman on the Louisville & Nashville at Evansville, Ind. In the latter part of 1896 he became assistant engineer for the Columbus & Hocking Coal & Iron Company at Straitsville, Ohio. The following two years he was successively assistant supervisor on the Louisville & Nashville at Belleville, Ill.; section foreman at Evansville, Ind.; rodman at Louisville, Ky., and assistant engineer at Clarksville, Tenn. In December, 1898, he was made assistant engineer in the chief engineer's office at Louisville, Ky. In the fall of 1901 he became roadmaster at Elizabethtown, Ky., where he remained until October, 1904. He was then appointed division engineer of the Indianapolis Southern at Indianapolis, Ind., and in March, 1905, was made principal assistant engineer of the Illinois Central, the Yazoo and Mississippi Valley and the Indianapolis Southern, with office at Chicago. Mr. Brumley was engineer of construction of the two former roads from June, 1910, to April, 1913, when he was appointed engineer maintenance of way. In November, 1913, he was appointed assistant chief engineer, with headquarters at Chicago, and in April, 1914, he was appointed valuation engineer, which position he held until his appointment as chief engineer of the corporation, as mentioned above.

DANIEL JOSEPH BRUMLEY

Paul J. Neff, district engineer on the St. Louis-San Francisco, with headquarters at Springfield, Mo., has been appointed corporate engineer, with office at St. Louis. Mr. Neff was born at St. Louis, Mo., on July 14, 1884, and after graduation from Kansas State University, entered railway service on February 1, 1907, with the St. Louis-San Francisco as a rodman. In June of the same year he left railroad service for three months, but returned in September as a transitman and assistant engineer. In July, 1911, he was made assistant to the chief engineer, and from August, 1917, to September, 1918, was district engineer, which position he held when appointed corporate engineer, as noted above.

Louis C. Fritch, until recently general manager of the Seaboard Air Line, has been made vice-president of the Chicago, Rock Island & Pacific, and also of the Minneapolis & St. Louis railway companies, with headquarters at Chicago. Mr. Fritch was born at Springfield, Ill., in 1868, and took a course in civil engineering in the University of Cincinnati, followed by a course in law. He was admitted to the bar in Ohio. He began railway work as a supervisor's assistant on the Ohio & Mississippi in 1884. From January, 1886, to October, 1892, he was assistant engineer, and then to November, 1893, engineer maintenance of way of the same road. He was also chief engineer in charge of construction on the Cincinnati & Bedford. On November 1, 1893, he was appointed division engineer of the Baltimore & Ohio Southwestern, which absorbed the Ohio & Mississippi. From September, 1899, to November, 1902, he was superintendent of the Mississippi division of the same road. In February, 1904, he went to the Illinois Central, Chicago, and was engaged in special work until 1909, when he became chief engineer of the Chicago Great Western, a position he occupied until 1914, when he was appointed assistant to the president of the Canadian Northern. In August, 1915, he was appointed general manager of the Canadian Northern lines east of Port Arthur. On June 15, 1917, he was appointed general manager of the Seaboard Air Line, with office at Norfolk, Va. Recently he left this road to take up private engineering practice, in which he was engaged when the appointments above became effective.

LOUIS C. FRITCH

GENERAL

A. W. McClellan, division engineer on the Pennsylvania Railroad, eastern lines, with headquarters at Altoona, Pa., has been promoted to assistant superintendent of the Philadelphia division, with office at Frazer, Pa.

J. G. Bloom, whose promotion to superintendent of the Louisiana division of the Chicago, Rock Island & Pacific was announced in the September *Railway Maintenance Engineer*, was born at Xenia, Ohio, on November 25, 1869. Mr. Bloom graduated from the civil engineering course of Ohio State University in 1889. In August of that year he entered the service of the Pennsylvania Lines in an engineering corps

at Cincinnati, Ohio. For the next year and a half he was with the Norfolk & Western as assistant roadmaster at Petersburg, Va., following which he engaged in city engineering work at Xenia, Ohio. In April, 1892, he became instrument man on the Baltimore & Ohio South Western at Cincinnati, and until 1902 he was consecutively assistant engineer, division engineer and principal assistant engineer, following which he became division engineer on the Baltimore & Ohio at Newcastle, Pa. In 1903, he entered the service of the Chicago, Rock Island & Pacific as principal assistant engineer at Topeka, Kan., and subsequently became engineer maintenance of way on the Southwestern and Choctaw districts. In January, 1910, he resigned to become president of the Southern Ballast Company at Lester, Okla. Later he became superintendent of construction with the J. F. Stevens Construction Company of New York and the Robert Grace Contracting Company of Pittsburgh, Pa. In October, 1914, he returned to the Rock Island, with which road he was engaged on valuation work until July 1, 1916, when he became superintendent of the Amarillo division at Amarillo, Texas. In the spring of 1918 he was appointed division engineer, with headquarters at Herington, Kan., which position he held at the time of his promotion to superintendent of the Louisiana division at El Dorado, Ark., as mentioned above.

ENGINEERING

H. J. Armstrong has been appointed division engineer of the Missouri & North Arkansas, at Harrison, Ark.

V. V. Kirkpatrick has been appointed valuation engineer of the Missouri & North Arkansas, with office at Kansas City, Mo.

E. L. Collette, assistant engineer of the St. Louis-San Francisco at Springfield, Mo., has been appointed district engineer at that point, succeeding **P. J. Neff.**

G. F. McCormack has been appointed assistant division engineer of the Sacramento division of the Southern Pacific lines, with headquarters at Sacramento, Cal.

H. S. Freeman, chief draftsman of the Great Northern, with office at St. Paul, Minn., has been appointed office engineer, succeeding **D. J. Kerr,** recently appointed corporate engineer.

J. L. Kirby, division engineer on the Seaboard Air Line at Atlanta, Ga., has been promoted to engineer maintenance of way, with headquarters at Norfolk, Va., vice **J. C. Nelson,** deceased.

W. S. Shaw, Jr., has been appointed division engineer on the Michigan Central, with headquarters at St. Thomas, Ont., succeeding **J. E. Johnson,** who has resigned to enter private business.

E. G. Lane, chief engineer of the Baltimore & Ohio, western lines, and the Baltimore & Ohio Chicago Terminal, whose headquarters are at Cincinnati, Ohio, has had his authority extended over the Chicago Heights Terminal Transfer Railroad.

J. Q. Barlow, assistant chief engineer, and **R. M. Drake,** maintenance of way assistant to the chief engineer on the Southern Pacific, Pacific system, with headquarters at San Francisco, Cal., have resigned.

W. H. Penfield, engineer of track maintenance of the Chicago, Milwaukee & St. Paul lines east of the Missouri river, with headquarters at Chicago, has had his jurisdiction extended over the lines west of Mobridge, S. D.

C. F. Loweth, chief engineer of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, has had his jurisdiction extended over the Escanaba & Lake Superior and the Ontonagon railroads, with the same headquarters, effective October 1.

William McNab, valuation engineer for the Grand Trunk System, with office at Montreal, Que., has been appointed chairman of the Valuation committee, succeeding H. R. Safford, who has been appointed engineering assistant to the director of the Central Western region, United States Railroad Administration. **Arthur Crumpton,** assistant valuation engineer, succeeds Mr. McNab as valuation engineer.

E. F. Mitchell, chief engineer of the Texas & Pacific and other lines under the jurisdiction of J. L. Lancaster, federal manager, with headquarters at Dallas, Tex., has had his authority extended over the Weatherford, Mineral Wells & Northwestern.

A. S. Kent, chief engineer of the Chicago, Indianapolis & Louisville, with headquarters at Chicago, has been appointed also chief engineer of the Cincinnati, Indianapolis & Western, which road has been consolidated with the C. I. & L. for operating purposes.

C. F. Losh, assistant engineer of the Norfolk & Western at Portsmouth, O., has been appointed valuation engineer, with office at Roanoke, Va., succeeding Charles S. Churchill, chief of valuation, who has resigned to become vice-president with the corporation.

H. Rettinghouse, chief engineer of the Chicago, St. Paul, Minneapolis & Omaha, with headquarters at St. Paul, has had his authority extended over the St. Paul Union Depot Company, in so far as it concerns duties incident to the operation of the existing station.

A. H. Hogeland, chief engineer of the Great Northern and the Midland Railway of Manitoba, with headquarters at St. Paul, Minn., has had his jurisdiction extended over the Farmers' Grain & Shipping Railroad, with the same headquarters, effective October 1.

H. R. Carpenter, chief engineer of the Missouri Pacific, the St. Louis Southwestern and the Louisiana & Arkansas, with headquarters at St. Louis, Mo., has had his jurisdiction extended over the Memphis, Dallas & Gulf, with the same headquarters, effective October 1.

A. H. Freygang, division engineer maintenance of way of the Baltimore & Ohio at Chillicothe, Ohio, has been appointed assistant to the engineer maintenance of way of the Baltimore & Ohio, western lines, the Dayton & Union and the Dayton Union Railroad, vice **H. R. Gibson,** promoted.

C. P. Richardson, assistant engineer of track elevation of the Chicago, Rock Island & Pacific, with headquarters at Chicago, resigned, effective October 19, to take a position as cost engineer on the Davenport, Iowa, project of the United States Housing Corporation, with headquarters at Davenport, Iowa.

N. W. H. Schafer, Jr., supervisor of the Philadelphia & Reading, with headquarters at Lebanon, Pa., has been appointed division engineer at Harrisburg, succeeding **John S. Goodman,** who has been transferred to Tamaqua, Pa. Mr. Goodman succeeds **W. D. Kenzie** at Tamaqua, who has been transferred to Reading, succeeding in turn **John C. Wrenshall, Jr.,** who has been transferred to Philadelphia.

G. H. Ballantyne, assistant engineer on the Western Pacific, with office at San Jose, Cal., has been appointed division engineer of the Eastern division of the Western Pacific, also with jurisdiction over the Deep Creek Railroad, with headquarters at Elko, Nev., and **T. L. Phillips,** assistant engineer of the Western Pacific, at Oakland, Cal., has been appointed division engineer of the Western division, with headquarters at Sacramento.

John C. Wrenchall, Jr., division engineer of the Philadelphia & Reading, with office at Reading, Pa., has been transferred to the New York division, with headquarters at Philadelphia; **W. D. Kenzie,** division engineer at Tamaqua, succeeds Mr. Wrenshall; **John S. Goodman,** division engineer at Harrisburg, succeeds Mr. Kenzie, and **N. W. H. Schafer, Jr.,** supervisor at Lebanon, has been appointed division engineer at Harrisburg, succeeding Mr. Goodman.

G. W. Corrigan, division engineer of the San Joaquin division of the Southern Pacific, with headquarters at Bakersfield, Cal., has been transferred to the Los Angeles division, with office at Los Angeles, succeeding **W. M. Jackle,** who has been promoted. **P. T. Robinson,** assistant division engineer of the Los Angeles division at Los Angeles, has been promoted to division engineer of the San Joaquin division, succeeding Mr. Corrigan, while **E. H. Miller** succeeds Mr. Robinson as assistant division engineer at Los Angeles.

A. A. Miller, engineer maintenance of way on the Missouri Pacific, at Little Rock, Ark., has been appointed district engineer at Kansas City, Mo., succeeding **J. R. Leighty,** and the title of engineer maintenance of way has been changed to district engineer; **J. A. Lahmer,** drainage engineer at St. Louis, Mo., succeeds Mr. Miller as district engineer at Little Rock; **W. M. Neptune,** assistant engineer at St. Louis, has been appointed principal assistant engineer, succeeding Mr. Lahmer; Mr. Neptune will have charge of water service, drainage, flood and river bank protection, with headquarters at St. Louis.

J. Mitchell Silliman, who has been appointed division engineer of the Delaware & Hudson, with headquarters at Oneonta, N. Y., was born at Easton, Pa., on September 8, 1885. He graduated from Lafayette College as a civil engineer in June, 1907, and immediately entered railway service as a levelman with the Canadian Pacific. Following this, he was consecutively levelman and transitman on various projects until March, 1911, when he was promoted to resident engineer in charge of the construction at Guelph Junction, Ont. In September, 1912, he was placed in charge of construction on the Forsyth Street branch at Montreal, Que., and in March, 1915, he was promoted to district engineer of construction of the line from Galt to Port Dover, Ont. From December, 1915, to December, 1917, he was resident engineer on maintenance on the Laurentian division at Montreal and on the latter date he was transferred to the London division, with headquarters at London, Ont., where he remained until he received the appointment noted above.

Harry G. Clark, maintenance of way assistant to the federal manager of the Chicago, Rock Island & Pacific, has been appointed chief engineer of that road, with headquarters at Chicago. He was born at Leavenworth, Kan., on July 8, 1875, and graduated from the civil engineering course at the University of Kansas in 1898. In September of that year he entered the service of the Atchison, Topeka & Santa Fe as chainman on its Kansas lines. Subsequently he was a rodman on construction and transitman on location with the Chicago, Burlington & Quincy in Iowa; from October, 1900, to September, 1905, he was successively resident engineer and division engineer on the western division of the Choctaw, Oklahoma & Gulf, now a part of the Rock Island, and division engineer of the Pan Handle and Arkansas divisions of the Rock Island. From September, 1905, to October, 1909, he was first district engineer on the Choctaw district, and from the latter date to June, 1912, trainmaster on the Arkansas and Oklahoma divisions. Mr. Clark was then appointed assistant to the second vice-president, and later he held the same position under the first vice-president in charge of operation. On August 1, 1918, he was appointed general supervisor of maintenance of way, which position he held at the time of his appointment as chief engineer, as mentioned above.

HARRY G. CLARK

William Joseph Bergen, first assistant to the chief engineer of the New York, Chicago & St. Louis, with headquarters at Cleveland, Ohio, has been appointed chief engineer of the corporation with the same headquarters. Mr. Bergen was born at Waterbury, Conn., on February 16, 1872, and graduated from Rensselaer Polytechnic Institute at Troy, N. Y., in June, 1897. In May, 1899, he entered railway service as assistant to the division engineer on construction of the Burlington & Missouri River, now a part of the Chicago, Burlington & Quincy; from July, 1899, to January, 1900, he was levelman and instrument man on location with the same road, and from January, 1900, to July, 1901, he was division engineer on construction. In the ensuing five and one-half years he was assistant engineer on the New York, Chicago & St. Louis and from January, 1907, to August of the same year, he was chief supervisor of track. On the latter date he was promoted to first assistant to the chief engineer, which position he held until his recent appointment as chief engineer of the corporation, as mentioned above.

J. B. Myers, district engineer maintenance of way in charge of the Maryland district of the Baltimore & Ohio, with headquarters at Baltimore, Md., whose appointment as engineer maintenance of way, eastern lines, with the same headquarters, has already been announced in these columns, was born on August 4, 1879. Mr. Myers was educated in Allegheny College, graduating as a civil engineer with the class of 1900. He entered the employ of the Baltimore & Ohio as a rodman on the Pittsburgh division in April, 1901, and has since been employed continuously in the engineering department of this road. In May, 1903, he was appointed assistant division engineer of the Pittsburgh division and later served in the same capacity on the Cumberland division. In August, 1905, he was appointed assistant engineer of construction on the Cumberland division and was promoted to division engineer of that division in September, 1907. In April, 1914, he was promoted to district engineer maintenance of way of the Maryland district, which position he held at the time of his recent promotion, as noted above.

J. B. MYERS

Hans Henrich Holmberg, whose appointment as acting assistant division engineer of the Utah division of the Oregon Short Line, with headquarters at Pocatello, Idaho, was announced in the October issue of the *Railway Maintenance Engineer,* was born at Altona, Holstein, Germany, on February 11, 1855. He attended the Hamburg and Leipzig universities from 1872 to 1875 and came to this country in 1882, taking out his final naturalization papers in 1887. After spending 12 years in hydraulic and municipal engineering, he entered railway service in 1897 as a rodman with the Oregon Short Line and the next year was made a draftsman in the chief engineer's office. He remained there until 1903, when he went with the Western Pacific as topographer and draftsman on location work. In 1904, he returned to the Utah division of the Oregon Short Line as chief draftsman, which position he held until 1915, when he became assistant engineer of this division, holding this position until appointed acting assistant division engineer, as noted above.

John P. Caswell has been appointed division engineer on the London division of the Canadian Pacific at London, Ont., succeeding **J. M. Silliman,** resigned to accept service with another company. Mr. Caswell was born at Coldwater, Ont., on April 13, 1891. He secured his first railway experience during the summers of 1907-1908-1909 as a chainman in the construction department of the Canadian Pacific. In 1910 he became regularly engaged with this road, serving as chainman until 1911, when he was transferred to the construction department as a rodman. Later in 1911 he engaged with the South Ontario Pacific as instrumentman and subsequently served in a like capacity on the Canadian Pacific, on the Lake Erie & Northern and for Westinghouse, Church, Kerr & Co. and the Foundation Company, Ltd. In 1917 he was made senior transitman in the maintenance of way

department of the Canadian Pacific at London, Ont. He left railway service in January, 1918, to take a position as senior transitman with the Hydro-Electric Power Company on canal construction at Niagara Falls, where he remained until receiving his appointment, as noted above.

Paul Thompson Robinson, who has been appointed division engineer of the San Joaquin division of the Southern Pacific, with office at Bakersfield, Cal., as noted elsewhere, was born at Hubbard, Iowa, on February 12, 1882, and entered railway service in June, 1900, as a rodman on the Nebraska division of the Union Pacific. He remained there for two years, when he left to enter Rose Polytechnic Institute. In 1903 he returned to the Union Pacific as a rodman, serving in this capacity until 1907, when he became an assistant engineer for the Oregon Railroad & Navigation Company at Portland, Ore. He held this position a year, when he went to the Southern Pacific as office engineer, with headquarters at Sacramento, Cal. The next year he became roadmaster and in 1913 he was made assistant division engineer, with office at Stockton. From 1917 to 1918 he was engineer for the assistant general manager, being appointed assistant division engineer early in 1918, which position he held when promoted to division engineer, as noted above.

Norman Henry Schafer, supervisor on the Harrisburg division of the Philadelphia & Reading, with office at Lebanon, Pa., has been promoted to division engineer of that division, with headquarters at Harrisburg. Mr. Schafer was born at Pennington Seminary, N. J., on February 1, 1885, and was educated at Lehigh University, graduating in the class of 1908. He began railway work in October, 1905, as rodman in the office of the chief engineer of the Reading and from April 15, 1906, to September 1, of that year, he served as draftsman in the office of the engineer of maintenance of way of the Pennsylvania. After his graduation he entered the service of the Lehigh & Susquehanna Coal Company at Shamokin, Pa., on September 1, 1908. He left this service in April 15, 1909, and entered the engineering department of the Reading, where he has since been continuously engaged. He first worked as rodman in the chief engineer's office at Philadelphia, and was made assistant supervisor at Reading on October 15, 1909. In April, 1910, he was transferred to Pottstown, Pa., and on January 1, 1912, he was promoted to supervisor on the Harrisburg division at Boiling Springs, Pa. In July, 1917, he was transferred to Lebanon, Pa., where he remained until receiving his appointment, as noted above.

William Travers, assistant division engineer of maintenance of the Oregon Short Line, with headquarters at Pocatello, Idaho, has been promoted to division engineer of the Utah division of that road, with the same headquarters. He was born on May 4, 1883, at Salt Lake City, Utah, and graduated from the University of Utah in 1905. In September of that year he began railroad work with the Oregon Short Line as a draftsman on the chief engineer's forces. In September, 1906, he was appointed assistant engineer in charge of construction on the Nevada Northern Railway and in April, 1908, he became assistant engineer on the location of the Copper River & Northwestern in Alaska. A year later he again entered the service of the Oregon Short Line in the capacity of resident engineer on construction work. From July, 1914, to March, 1915, he was assistant division engineer on the Los Angeles & Salt Lake and from May, 1915, to July, 1917, assistant engineer on the Oregon Short Line. On the latter date he was promoted to the position of assistant division engineer on the same road, which position he held until his appointment, noted above.

TRACK

William Metcalf has been appointed roadmaster on the Kansas City division of the Chicago, Milwaukee & St. Paul, with headquarters at Blakesburg, Ia., succeeding **R. F. Scott,** resigned.

E. L. Loftin, supervisor of bridges and buildings on the Alabama & Vicksburg, with headquarters at Vicksburg, Miss., has been appointed roadmaster, with the same headquarters, succeeding **H. Curry,** who has been made supervisor at Meridan. **W. W. East,** supervisor at Newton, has been transferred to Vicksburg.

William Troutfetter, assistant roadmaster on the Michigan Central, has been promoted to roadmaster, with headquarters at Jackson, Mich., succeeding **John McConnell,** who has been transferred to Niles. Mr. Troutfetter was born at Niles, Mich., on September 1, 1864, and entered railway service in 1880, with the Michigan Central as a section laborer. Eight years later he was made section foreman, and several years later was made extra gang foreman. In 1914 he became assistant roadmaster, which position he held when appointed roadmaster, as noted above.

F. A. Greene has been appointed roadmaster on the Southern Pacific, with headquarters at Tracy, Cal., succeeding **J. A. MacDonald,** assigned to other duties. Mr. Green was born in California on February 25, 1871. After a grammar school education and a course with the International Correspondence School, he entered railway service on July 30, 1895, as a section laborer with the Southern Pacific. He continued at this employment until February, 1897, when he became section foreman. He was employed continuously in this capacity except for occasional service as extra gang foreman or acting roadmaster until appointed roadmaster, as noted above.

Martin Lee Melsen has been appointed acting roadmaster on the Omaha division of the Missouri Pacific, with headquarters at Auburn, Neb., succeeding **G. Kuhn,** assigned to other duties. He was born on September 8, 1874, at Monroe City, Mo., and entered railway service on September 1, 1890, with the Chicago, Rock Island & Pacififfc as a laborer, being promoted to section foreman later. On June 3, 1900, he went to the Missouri Pacific as section foreman and served in turn as extra gang, yard and construction foreman and at short intervals as acting roadmaster, when he was appointed acting roadmaster, as noted above.

A. F. Harlow, who has been appointed roadmaster of the Denver & Rio Grande, with headquarters at Gunnison, Colo., was born on November 21, 1877, at Breckenridge, Mo. He entered railway service as a laborer on the Chicago, Burlington & Quincy in April, 1898, and in October, 1899, was promoted to section foreman. In May, 1904, he entered the service of the Missouri Pacific and one year later returned to the Burlington as section and extra gang foreman. In September, 1914, he was employed by the Union Pacific as terminal foreman and remained with that road until August of this year, when he went to the Denver & Rio Grande in the capacity of roadmaster, as noted above.

Dougald Cameron, who has been appointed roadmaster on the Chicago, Burlington & Quincy, with headquarters at Chicago, was born at Aberdeen, Scotland, on August 26, 1884. After a public school education and a course at Robert Gordon's College in Aberdeen, he went to work in 1902 for Walker & Duncan, engineers and architects in Aberdeen, coming to America in 1908. On September 27, 1909, he entered railway service with the Chicago, Burlington & Quincy as a rodman. In June, 1911, he was made instrumentman, two years later became draftsman and in July, 1915, was made assistant engineer. In March, 1917, he was assigned to work on the construction of a new yard at Clyde, Ill., where he remained until appointed roadmaster, as noted above.

BRIDGE

H. M. Jack, general foreman of bridges and buildings on the International & Great Northern, with headquarters at Palestine, Texas, has resigned.

J. W. Reid, bridge engineer of the Chicago & Alton, with headquarters at Chicago, has resigned to enter the service of the Robins Conveying Belt Company of Chicago, in an engineering capacity.

The jurisdiction of P. Swenson, superintendent of bridges and buildings of the Minneapolis, St. Paul & Sault Ste. Marie, has been extended over the Duluth, South Shore & Atlantic and the Mineral Range, with headquarters at Minneapolis.

PURCHASING

J. L. Bennett, purchasing agent of the Central of Georgia, has been appointed purchasing agent also of the Wrightsville & Tennille, the Louisville & Wadley, the Sylvania Central, and the Wadley Southern, with headquarters at Savannah, Ga.

W. A. Linn, purchasing agent of the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, has had his jurisdiction extended over the Escanaba & Lake Superior and the Ontonagon railroads, with the same headquarters, effective October 1.

I. Seddon, purchasing agent of the Chicago, St. Paul, Minneapolis & Omaha, with headquarters at St. Pual, Minn., has been appointed also purchasing agent of the St. Paul Union Depot, the Minneapolis Eastern and the Minnesota Transfer, with the same headquarters.

G. W. Saul, purchasing agent of the Oregon-Washington Railroad & Navigation Company and the Yakima Valley Transportation Company, has been appointed purchasing agent also of the Northern Pacific Terminal of Oregon and the Pacific Coast Railroad, with headquarters at Portland, Ore., effective September 12.

Charles A. How, purchasing agent of the Missouri Pacific, the St. Louis Southwestern and the Louisiana & Arkansas, with headquarters at St. Louis, Mo., has had his jurisdiction extended over the Memphis, Dallas & Gulf, with the same headquarters, effective October 1.

E. J. Roth, purchasing agent of the Chicago, Indianapolis & Louisville, has been appointed manager of store section organized by the Central Advisory Purchasing Committee of the Railroad Administration, to exercise supervision over storekeeping departments of the railroads.

J. H. Clemmitt has been appointed purchasing agent of the Norfolk & Western, with office at Roanoke, Va., vice **E. T. Burnett,** who is now chairman of the Regional Purchasing Committee for the Pocahontas region. The position of assistant purchasing agent has been abolished.

F. A. Bushnell, purchasing agent of the Great Northern, with headquarters at St. Paul, Minn., and also a member of the Northwestern regional purchasing committee, has had his jurisdiction extended over the Farmers' Grain & Shipping Railroad, with headquarters at St. Paul, effective October 1.

MILITARY SERVICE

Major F. G. Jonah, corps of engineers, who was formerly chief engineer of the St. Louis-San Francisco, has been promoted to the rank of lieutenant-colonel.

Major G. M. Rice, corps of engineers, who was formerly chief engineer of the Puget Sound & Willapa Harbor, has been promoted to the rank of lieutenant-colonel.

Captain L. M. Pill, formerly valuation engineer on the Mobile & Ohio, with headquarters at Mobile, Ala., has been commissioned a major on the general staff of the American Expeditionary Forces in France.

OBITUARY

Owen Marsaline, division supervisor of water service on the Louisiana division of the Illinois Central, with headquarters at McComb, Miss., died of Spanish influenza on October 15.

Hiram W. Belnap, manager of the safety section of the Division of Operation, United States Railroad Administration, and formerly for seven years chief of the bureau of safety of the Interstate Commerce Commission, died at his home in Washington on October 12 of pneumonia following an attack of Spanish influenza.

John C. Nelson, engineer maintenance of way of the Seaboard Air Line, died at Norfolk, Va., on October 6. He was born at Belton, Tex., on November 3, 1862. He began railway work as a rodman with an engineering corps on the Richmond & Mecklenburg in July, 1882. He went to the Seaboard Air Line as engineer maintenance of way in 1907.

CONSTRUCTION NEWS

Baltimore & Ohio.—This road is making improvements to its roundhouse facilities at Lorain, Ohio, which will cost about $156,000.

This road has awarded a contract to T. S. Leake & Co., Chicago, for extensions to roundhouses at Flora, Ill., and East St. Louis. At the former point eight 102-ft. stalls will be added to the present structure and at East St. Louis, 11 additional 100-ft. stalls will be constructed. The extensions will be brick construction. The contract was awarded on a cost plus percentage basis.

The Chicago & Alton has awarded a contract to Stresenreuter, Cotton & Co., Chicago, to construct 14 one-story bunk houses for Mexican laborers. Each house will be 20 ft. by 60 ft. and will contain four rooms and a court through the center somewhat after Mexican style. The walls will be of hollow tile and the floors of concrete. The new buildings will be located at Dwight, Ill., Chenoa, Elkhart, Sherman, Fancy Prairie, Auburn, Godfrey and Yeomans.

The Chicago, Milwaukee & St. Paul has awarded contracts to Paul Riesen & Son, Milwaukee, Wis., for the construction of a reinforced concrete mechanical coaling plant at New Lisbon, Wis., to cost about $25,000, and a plant of similar type and cost at Watertown Junction.

The Indianapolis Union Railway will build a passenger train shed at Indianapolis, Ind., in connection with the track elevation work now in progress. The general contract for the construction of the train shed, exclusive of steel work and the foundation, has been awarded to Latham & Walters, general contractors, Indianapolis. The work to be done under the general contract will amount to approximately $900,000.

The Illinois Central has awarded a contract to T. S. Leake & Co., Chicago, to construct an extension to its freight house at Rockford, Ill. The structure will be a one-story brick building 32 ft. by 148 ft. with a slate roof and a platform 8 ft. to 10 ft. wide and 212 ft. long. It wil have a plank floor on a concrete base and the platform will be protected by a canopy covered with Paroid roofing. The improvement will cost about $25,000.

This road is receiving bids for a one-story freight house 40 ft. by 200 ft. at Herrin, Ill., to cost about $25,000. The road has awarded a contract to Joseph E. Nelson & Sons, Chicago, for the construction of a one-story 40-ft. by 200-ft. passenger station, freight house and express building at Stithton, Ky., the cost of which is estimated at $85,000. The same contractor has also been awarded a contract for the construction of water works facilities at Du Quoin, Ill. The Railroad Water & Coal Handling Company, Chicago, has been awarded the contract for water work facilities at Bois, Ill. A contract has been given to G. A. Johnson & Son, Chicago, for the construction of engine pits and paving in a roundhouse at Jackson, Miss.

The Long Island Railroad has awarded a contract to the Austin Company, Cleveland, for the construction of a building 60 ft. by 225 ft. at Jamaica, N. Y., to cost approximately $40,000 and to be erected in 45 working days.

The Michigan Central has awarded a contract to G. F. Bristol, Detroit, Mich., for the erection of an overhead bridge at Miles street, Ypsilanti, Mich., to carry a highway over the tracks of the railway. The viaduct will replace an old structure which has been in existence since the railroad was built through the city. The bridge will be built practically on the site of the old one, except that it will be skewed over the tracks so as to carry the highway practically in a straight line. The bridge will be of steel girders and reinforced concrete construction and will cost approximately $40,000.

The Strauss Bascule Bridge Company is preparing plans for the construction of a double-track lift bridge to carry the Michigan Central and the New York Central tracks over the River Rouge, south of Detroit, Mich., to replace an old

structure which is too light to carry the increased loads. The river is to be widened and deepened under the Rivers and Harbors Act, and consequently the new bridge will have a clear opening of 125 ft. The structure will be of steel and the estimated cost $541,000, which will be borne equally by the two railroads. Bids have not yet been asked for.

The Michigan Central has commenced the construction of a classification yard, a roundhouse, machine shop, transfer platform, car repair yard, etc., and a connection between the main line and the Air Line division at Niles, Mich., to cost approximately $1,358,000. The appropriation for this year includes the completion of a 30-stall roundhouse, a machine shop, a coaling station and other facilities needed at the engine terminal and for the building of about 47 miles of track. About 500,000 cu. yd. of grading is involved in the work now under way. Joseph E. Nelson & Son, Chicago, have the contract to erect the roundhouse and other buildings; the Link Belt Company, Chicago, has a contract for the construction of a 300-ton coaling station, and the Dominion Construction Company, Toronto, Ont., has been given a contract for the grading, and will do the track laying and ballasting.

The Missouri Pacific will soon commence the construction of an engine house at Council Grove, Kan., to cost about $6,000. The building will have three stalls, 110 ft. long, and will be constructed by railroad forces. The rear walls of the structure will be of brick and the balance of the building will be of heavy frame construction.

The road is now constructing a store and oil house, 40 ft. by 75 ft., at Osawatomie, Kan., which will cost approximately $15,000. It will be a one-story brick structure with concrete basement and timber roof. The work is being done by J. C. Duncan, St. Louis, Mo.

A contract has also been let for the construction of a dry lumber shed at Sedalia, Mo., which will cost approximately $10,000.

The Pacific Great Eastern has awarded a contract to the Northern Construction Company, Ltd., Vancouver, B. C., for an extension from Mile 183, north of Squamish, B. C., to Mile 225 north of that point, or a distance of 42 miles. In addition to grading, track-laying, ballasting and the installation of telegraph and telephone lines, the work involves the construction of station buildings, section houses, water tanks and four timber trestles, two of which will be 300 ft. in length, one 600 ft. and one 900 ft. long. Track has been laid for seven miles and one bridge has been constructed. J. W. Kelly, Clinton, B. C., has the contract for the construction of the bridges, which involve the use of 684,000 ft. b. m. of lumber.

The Roberts & Schaefer Company, Chicago, has been awarded a contract by the Chesapeake & Ohio to build a 500-ton capacity reinforced concrete, automatic, electric locomotive coaling plant at Concord, Ky., in which the Duplex shallow pit feeder will be used. A similar plant is also being constructed for this company at Handley, W. Va.

This company has also received a contract from the Pennsylvania Railroad, western lines, to replace its present elevating equipment at its coaling plant at Conway, Pa., with standard, automatic-electric duplicate counter balanced elevating buckets, with R and S tram car distributing equipment on the existing bins. The Pennsylvania has also awarded two other contracts to Roberts & Schaefer, one for a 1,000-ton reinforced concrete automatic-electric locomotive coaling plant for four tracks, to be installed at Dennison avenue, Columbus, Ohio, and the other for a 500-ton four-pocket coaling plant of reinforced concrete construction, with automatic-electric elevating equipment, for installation at Richmond, Ind.

STRUCTURAL STEEL

The Great Northern has ordered 675 tons of steel for deck and through girder spans from the Milwaukee Bridge Company.

The St. Paul Union Depot Company has ordered 272 tons of structural steel from the St. Paul Foundry Company for the new union station at St. Paul, Minn.

SUPPLY TRADE NEWS

GENERAL

The Baltimore & Ohio is making improvements to continued its creosoted wood block department and has turned over that portion of its business and practically all of its selling force to the **Republic Creosoting Company,** Indianapolis, Ind. **W. H. Blythe** of the Ayer & Lord Tie Company will have charge of the block department of the Republic Creosoting Company.

The Chicago Pneumatic Tool Company is contemplating the construction of a reinforced concrete plant in Detroit, Mich., five stories in height, with a finished basement, to cost between $200,000 and $250,000. The structure will be 180 ft. by 60 ft. The company also will build an extension to the erecting department to its No. 2 plant at Franklin, Pa. The building will be of brick and steel construction, 45 ft. by 150 ft., and will cost about $30,000. Bids are now being received on these buildings.

The W. J. Crouch Company, Inc., and **Rownson, Drew & Clydesdale, Inc.,** announce the amalgamation of their respective organizations. All trading and manufacturing operations henceforth will be conducted under the name of Rownson, Drew & Clydesdale, Inc., with general offices at 68 William street, New York. P. G. Donald, president of Rownson, Drew & Clydesdale will continue in this office, while I. Smullyan, president of the W. J. Crouch Company, will act as managing director of the new firm. Victor E. Karminski and A. E. Hearne, treasurer and general manager of the W. J. Crouch Company, Inc., and Rownson, Drew & Clydesdale, Inc., respectively, will in the future act as joint general managers of the new concern, Mr. Karminski conducting the Crouch steel division and Mr. Hearne directing all other trading operations. H. Lad Landau, assistant secretary and general sales manager of the W. J. Crouch Company, will continue with the new corporation in the same capacity. John H. Allen, purchasing agent, will in the future be assisted by M. Greenberg of Rownson, Drew & Clydesdale. Other officers will be, Albert Smullyan, controller; O. W. Andrews, traffic manager and head of the company's licensing bureau. Plans have been made for the further development and expansion of the Rownson, Drew & Clydesdale engineering division which will handle labor-saving devices. These plans will be carried out under the personal direction of John J. Smart, secretary and assistant general manager of the W. J. Crouch Company.

PERSONAL

John W. Twohy of Twohy Brothers, engineers and contractors, Seattle, Wash., has become general manager of the Seattle, North Pacific Shipbuilding Company.

H. G. Elfborg, consulting engineer and director of the Ajax Forge Company, has severed his connection with that concern. Mr. Elfborg has been connected with that company for the past 23 years.

A. E. Brown, formerly general agent of the Chicago & Alton, at Detroit, Mich., has been appointed manager of the railroad department of the Truscon Steel Company, with headquarters at Chicago.

A. E. Brown, former general agent of the Chicago & Alton, with headquarters at Detroit, Mich., and previously in the same capacity for the Denver & Rio Grande and the Western Pacific at that point, has been appointed manager of the railroad department of the Trucson Steel Company.

W. W. Coleman, president of the Bucyrus Company, South Milwaukee, Wis., has been appointed special representative to the chief of ordnance, with office at Washington. He will be in charge of all matters relative to the production of cannon, carriages, their equipment and appurtenances and accessories.

Albert H. Noyes, secretary and treasurer of the Ayer & Lord Tie Company, Chicago, has resigned to engage in active service with the American Red Cross in France and sailed for overseas duty on September 27.

William C. Curd, contracting engineer in the railroad department of Layne & Bowler Company, Memphis, Tenn., has resigned to enter the service of the William Graver Tank Works in its railroad department, with headquarters at Chicago. Mr. Curd was born at Somerset, Ky., on May 28, 1880. He was educated at Purdue University, and after completing the junior year in 1902, he entered the service of the Cincinnati, New Orleans & Texas Pacific, now a part of the Southern, with which road he was engaged on construction work. Later he was engaged on similar work on the Louisville & Nashville and the Union Pacific. In 1905 he was appointed engineer maintenance of way on the Macon, Dublin & Savannah at Macon, Ga. The following year he went with the Missouri Pacific as assistant engineer on maintenance work, with headquarters at St. Louis, Mo., and subsequently became drainage engineer in charge of water supply, water treatment and flood and river protection. He remained in the employ of the Missouri Pacific until 1917, when he resigned to go with the Layne & Bowler Company, as contracting engineer, at Memphis, Tenn.

WILLIAM C. CURD

M. V. Bailliere, formerly mechanical engineer of the New York Central lines west of Buffalo, with headquarters at Cleveland, Ohio, has become associated with the Roberts & Schaefer Company at Chicago, as contracting engineer of that company, succeeding **Clyde P. Ross,** who has been promoted to contracting manager. In his new position, Mr. Bailliere will be engaged in the designing, contracting and erection of locomotive coaling plants, "R and S" gravity sand plants and cinder handling plants. He is a graduate of the mechanical engineering school at Cornell University. After completing his work at Cornell he went to the Helena Power Transmission Company at Butte, Mont., where he remained for approximately a year and a half, following which he entered the service of the New York Central as a draftsman in the engineering department at Cleveland, Ohio. Subsequently he became assistant engineer and mechanical engineer, resigning from the latter position to go to the Roberts & Schaefer Company, as mentioned above.

M. V. BAILLIERE

A. H. Weston, who has been track engineer for the Lackawanna Steel Company, Buffalo, for the past eight years, has resigned to become general manager of the Key-Bolt Appliance Company, Buffalo, manufacturers of a new design of bolt for ship construction and track work. In addition to his duties as track engineer, Mr. Weston was engaged in the development and sale of track specialties for the Lackawanna Steel Company. He has also been active in the Track Supply Association, being president of this organization in 1913.

A. G. Lapierre, until recently assistant in the Northwestern regional director's office, has been appointed traffic manager of the Chicago Pneumatic Tool Company, with headquarters at Chicago, succeeding **E. H. Greene,** resigned. **F. O. Southbrook,** efficiency man with Joseph T. Ryerson & Son Co., Chicago, has been appointed manager of the order and production department of the same company, with headquarters at Chicago.

Charles Gustavus Roebling, president of the John A. Roebling's Sons Company of Trenton, N. J., who, with his brother, Washington Augustus Roebling, completed the construction of the Brooklyn Bridge, which was started by their father, John A. Roebling, died October 6 from Bright's disease at his home in Trenton, N. J. He was 69 years old and was born in Trenton. Mr. Roebling was president of the John A. Roebling's Sons Company of Trenton and Roebling, N. J., and of the New Jersey Wire Cloth Company of Trenton, and vice-president of the John A. Roebling's Sons Company of New York. He graduated from the Rensselaer Polytechnic Institute with the degree of civil engineer in 1871, and for a number of years was mechanical engineer of John A. Roebling's Sons Company. In 1881 he was engineer and contractor of machinery for the removal of the Cleopatra Needle from Alexandria, Egypt, to Central Park, New York, and in 1902 he made cables for the Williamsburg Suspension Bridge in New York. He assisted his brother, Washington A. Roebling, in the construction of the Brooklyn Bridge. Their father, who had undertaken the work, died in 1869, before the actual construction was begun.

TRADE PUBLICATIONS

Hydrated Lime in Concrete.—The Hydrated Lime Bureau of the National Lime Manufacturers' Association, Pittsburgh, Pa., has issued a four-page sheet of instructions on the manner of using this material, including method of packing, storing, proportions, method of measuring and incorporating. There is also a statement of special precautions necessary and results to be gained from its use in concrete.

Wood Preserving.—The Corbolineum Wood Preserving Company of New York has recently issued a circular in which the advantages and economies derived from supplementary surface treatment of timber are discussed at length. The information is concisely presented and includes service records of structures treated by this method. Several photographs illustrate clearly the method of application, while others show the condition of timber thus treated after years of service under various conditious.

Track Works.—The Morden Frog & Crossing Works, Chicago, Ill., has issued a new general loose leaf catalogue of 231 pages, which contains full page illustrations of the various products of this company, including rolled rail and manganese frogs, switches, crossing, switch stands, compromise joints and appurtenances for all forms of railway track work. The last 10 pages are devoted to tables of constants and dimensions for standard and narrow-gage turnouts and a very complete table of dimensions for tee-rail sections, covering practically all rails now in use for weights from 56 to 136 lb. per yd.

Pipe Corrosion.—A paper entitled "The Preservation of Hot Water Supply Pipe in Theory and Practice," presented by F. N. Speller and R. G. Knowlands at the annual meeting of the American Society of Heating and Ventilating Engineers and published in the journal of that society, has been reprinted in a 24-page booklet by the National Tube Company, Pittsburgh, Pa. This is a treatise on the subject of pipe corrosion and of the factors controlling it, and the broad, simple principles applying to every case of corrosion are briefly discussed, with particular reference to hot water supply systems. The discussion of the paper at the meeting is included, and the text is illustrated with several sketches and photographs.